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THE FÆROES.*

By KARL GROSSMANN, M.D., F.R.C.S.E.

THE following gives a short general account of three visits made to the Færoes in 1892, 1894, and 1895. On all three occasions I was accompanied by my friend Dr. Cahnheim, of Dresden; in 1894 also by my friend Mr. Lomas, of Liverpool. We so constantly and completely co-operated in every work done, that in this present article, as well as in a few more that have already appeared or will soon follow, we have all three a share, if not in the actual writing, at all events in the observations and views expressed therein.

As a map, we had with us the latest edition of the Admiralty chart, which is based on a survey by Captain Born in 1806. During the past summer (1895) a new survey has been commenced by a staff of Danish officers, but it is not likely that it will be finished for many years; and judging from the samples of one or two districts which we were privileged to inspect, the work promises to be excellent.

About midway between the west coast of Scotland and the south-east corner of Iceland, on the submarine volcanic ridge which connects both countries, a group of high peaks rises above the surface of the sea, forming a cluster of islands, called the Færoes. These islands, twenty-two in number, besides countless stacks, are mostly rocky and steep—so steep, in fact, that of their number nineteen only are inhabited by man, while the rest are scarcely accessible, and afford support only to numerous flocks of sheep.

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* Paper read at the Royal Geographical Society, November 25, 1895. Fær-öer means Sheep Islands; hence it would be a pleonasm to speak of Færoe Islands. Fair Isle has the same etymology.

The whole group of islands may be divided into a smaller southern group, formed by Suderö and the small isles Lille Dimon and Store Dimon, and a larger northern group, which comprises the remainder, and stretches a long distance from the eastern to the western extremity (from the most eastern to the most western island) in one direction, and from north-west to south-east in the other.

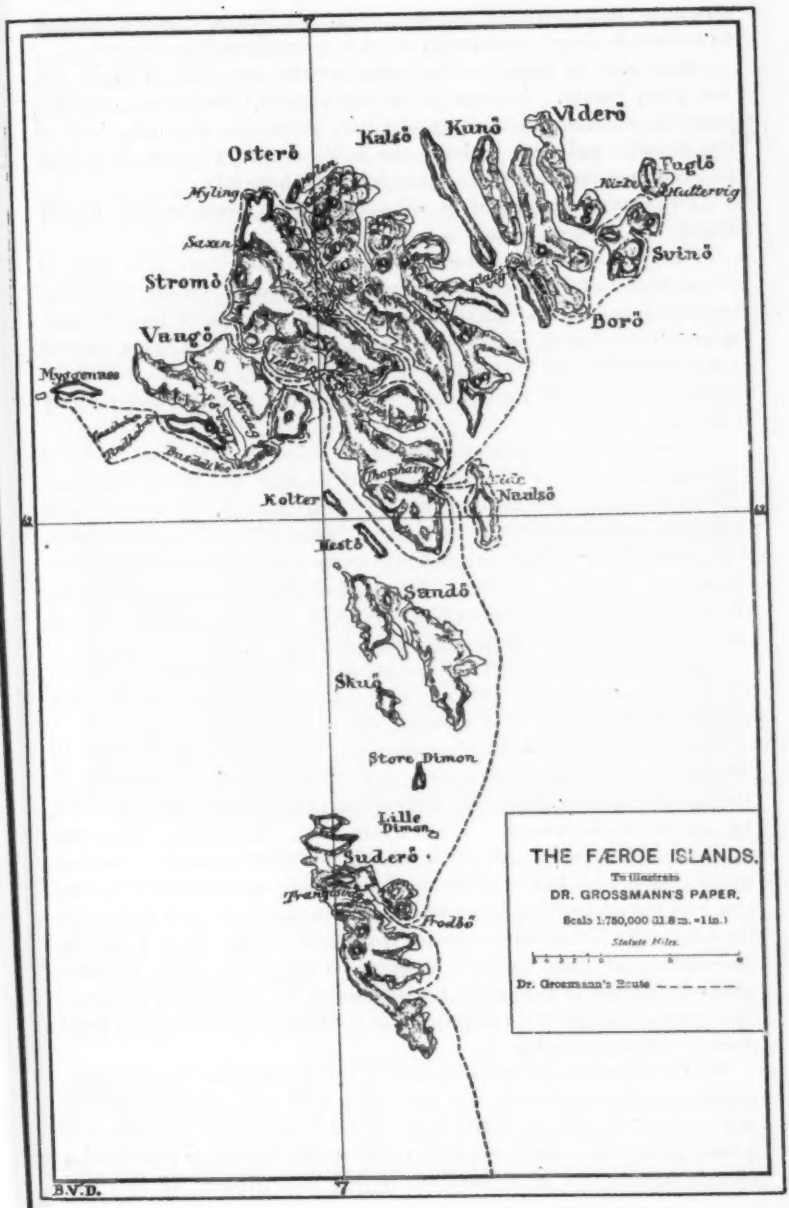
The general trend of the islands is from north-north-west to south-south-east. In this direction the mountains run and the principal fjords and valleys lie. If we were to draw a line from the most easterly to the most westerly point, from Fuglö to Myggenæs, it would cross the fjords and mountain ridges almost at right angles, and would mark the line of parting of the ancient icesheds and of the present watersheds. Along this line we find several saddles, or "cols," separating the northern from the southern part of a fjord; if the land were to sink only a few fathoms, these fjords would form separating channels like the one we see between the two largest islands, Stromö and Osterö. In that particular channel we find, on the spot which corresponds to the parting-line, a shallow called the "Sund," not more than 3 fathoms deep, where navigation is impossible except for small boats.

The geological structure of the Færoes is extremely simple, because of its great uniformity. The islands consist of a large number of layers of volcanic rock, consisting of vesicular as well as of more compact lava-flows with a generally low dip; hence a characteristic feature occurring so frequently in Færoese scenery—the straight horizontal outline of the mountain-tops. Often these lavas are exceedingly rich in amygdules, the cavities occasionally reaching a diameter of 2 feet and more. Exquisite zeolites are found in these cavities, and it is well known that the Færoes have supplied most museums with the finest specimens of these minerals.

Besides the amygdaloids and the lava, we find, though not frequently, columnar basalt in a few large intrusive sheets. The large sheet of Stromö at Skellinge has been known for a long time; in Suderö the basalt forms three fine sheets of columnar basalt, one at the entrance of the harbour just below Frodbö, another exposed close to the road at the western extremity of the village of Trangisvaag, in a quarry. High up above the village there is a third layer which stretches towards Frodbö.

The finest columns of all, however, were found by us in Myggenæs, at an altitude of 1400 feet, the thickness of the sheet varying from 60 to 80 feet. In the eastern islands we saw a very large intrusive sheet of basalt a little east of Kirke, on the southern cliff of Fuglö, and similarly one on the northern cliff of Svinö; possibly these two have formerly been parts of the same sheet.

In going from Kalbaksfjord (Stromö) overland to Leinum, we traversed an extensive sheet of basalt showing beautiful porphyritic


Osterö
Kalsö
Kunö
Viderö
Fuglö
Svinö
Borö
Stromö
Vaugö
Myggenæs
Kolter
Nualsö
Vestö
Sandö
Skuö
Store Dimon
Lille Dimon
Suderö
Frodbö
THE FÆROE ISLANDS.
To illustrate
DR. GROSSMANN'S PAPER.
Scale 1:750,000 (11.8 m. = 1 in.)
Statute Miles.
Dr. Grossmann's Scale
B.V.D.

structure; in a matrix of chocolate colour, the felspar crystals range up to an inch in length, and are grouped in crowded stellate clusters.

The minerals found in the rocky cavities are often of large size and great beauty. Zeolites of all kinds occur, chalcedony, chabasie, natrolite, stilbite, analcime, apophyllite, heulandite, also opal, both of the common and fiery variety; the latter is said to occur in a high mountain not far from, and to the east of, Leinum lake.

Two phenomena, as far as we know unique, were noticed, one on Naalsö, the other on Svinö.

Firstly: On the south-eastern coast of Naalsö there is a layer of 60 to 80 feet of dense doloritic lava. This layer is, broadly speaking, horizontal, and forms rudely shaped vertical columns of large dimensions. The columns, varying in thickness at different heights, present a wavy contour, and are split up again in secondary columns, which lie horizontally and at right angles to the wavy sides of the primary columns.*

Secondly: The north-eastern cliffs of Svinö show peculiar holes of various size, perfectly circular, from half an inch to 2 feet in diameter. These round holes are the sections of perfectly straight horizontal tubes looking exactly like artificial bore-holes. They occur at various heights, but, generally speaking, not much above sea-level. Some of the wider ones were at least 15 feet long, and all were perfectly straight. Whether they are long drawn-out vesicles of unusual size, or how they have come about, is at present an open question.

The general arrangement of the strata of all the islands is not very far out of the horizontal line. The dip is seldom more than 3° or 4°; only Suderö and Myggenæs have a steeper dip.

The cliff scenery is grand in the extreme. The rocks are cleft by vertical mastercracks, which form huge columns often extending to the whole height of the cliffs. Very frequently we find the cracks filled by injected dyke masses. These dykes have the typical horizontal columnar arrangement, and often branch into side injections. Seldom wider than 3 or 4 feet, they are most favourable starting-points for the attack of the destructive forces which are constantly at work to lay low the lofty cliffs of the weather-beaten coast-lines. Often we find that the sea washes out these injected masses to a height of about 30 feet; gradually a cave is formed, or a whole series of caves, until in time a cliff becomes completely undermined, and ultimately large masses break down and disappear (Fig. 5).

On the other hand, subaërial erosion is equally powerful in its destructive work. Frequently we saw the rocky cliffs split down vertically, and many a time did we notice huge cliffs slid down after the manner of a fault, along the coast-line partly in the water, the upper part leaning upright against the rock from which they had parted. In this way

* For further details, see *Proceedings Liverpool Geol. Soc.*, 1895, p. 302.

remarkably fine geological sections are revealed of over 2000 feet in height, and often so fresh that every detail of structure, every dyke, every lava-flow, every cavity, the dip, the occurrence of laccolites, etc., can be recognized with perfect distinctness.

Coal has long been known in Suderö. It has been worked there repeatedly, but never with any satisfactory financial result. The Danish geologist Johnstrup, who died last year, has published the best existing account of the occurrence of coal in Suderö. This summer (1895) a new survey has been made, and from private information I hear that for

FIG. 1.—VIEW FROM LEINUM LOOKING SOUTH. THE CONICAL ISLAND IN THE MIDDLE DISTANCE IS KOLTER.

the future the working of the Suderö coal-seams promises to be a commercial success.

In Myggenæs, which had the reputation of possessing coal, we actually found some in two horizons, the one close to the landing-place, and the other at an altitude of about 1300 feet. The coal of Myggenæs is mostly of a glossy kind, almost like jet; the Suderö coal is in some parts glossy, in others brittle and soils the fingers.

Signs of glacial action are of frequent occurrence, but the influence of subaërial and marine erosion tends to efface them rather rapidly. Roches moutonnées may be seen throughout the whole group of the islands up to a certain altitude; excellent examples are found near Quivig, on Stromö, and along the western coast-line of Osterö, opposite

Qualvig, down to Eide. Well-preserved glacial striæ can be seen in Suderö (Fig. 7); glacial mounds also in Suderö, Svinö, Osterö, Stromö, etc.; boulder clay was noted in Trangisvaag, Svinö, Fuglö, Borö, etc.*

From these observations there appears to be no doubt that the islands had a glaciation of their own, a conclusion which is inconsistent with the hypothesis of a big northern ice-cap. The remark in Prof. James Geikie's paper,† that there has been an ice-sheet coming from the northern group and intruding on the north of Suderö, will require a good deal of evidence before we can accept it, since we find everywhere the signs of local glaciation well pronounced.

A striking feature of the Færoes is their steep mountainous appearance. Hardly anywhere do we find flat parts, Thorshavn being almost alone in this respect. On the other hand, cirques as fine as could be found anywhere are of almost constant occurrence. Often these cirques reach high up to the top of lofty peaks, *e.g.* in Vaagö; sometimes we see one cirque above another, forming a sort of terraced valley, *e.g.* in Suderö, at Howe; sometimes the floor of the cirque reaches the surface of the water, *e.g.* at Tjornevig, on Stromö; and often a broken-down cirque is indicated by a few huge fragments, which testify to its original gigantic size, *e.g.* the island of Kolter (Fig. 1). A remarkable instance of this is also given in the case of Tindholm, the Drangar rocks, and the south-western cliffs of Vaagö, where a whole cluster of islets may be reconstructed into one large cirque (Fig. 6).

The *climate* is equable, the Gulf Stream preventing extreme heat in summer and cold in winter. Fogs are very frequent, and the annual rainfall is given as ranging from 70 to 80 inches, with 270 days of rain, *i.e.* three out of every four. Storms are also frequent, and to them is mainly due the absence of trees, there being but little soil to give hold for roots.‡ That there have been trees of a fair size in former times is shown by the fragments of stems and roots found in the bogs which yield peat. Probably these sites have been more sheltered in the past.

The journey undertaken in July, 1894, was favoured by exceptionally fine weather, and we were enabled to see more on that occasion than has been vouchsafed to nearly all previous travellers. Our desire to reach the easternmost isles—Svinö and Fuglö—could easily be realized. Equally successful were we in a visit to Myggenæs, the most westerly island, which, as far as I could ascertain, is inaccessible except on rare occasions.

When nearing Suderö, the usual veil of fog enshrouded the island,

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* For particulars, see the *Glacialists' Magazine*, June, 1895, p. 1.

† *Trans. R. Soc. Ed.*, 1880, xxx. p. 217.

‡ A climate of this description must, on the whole, prove rather unpleasant even to the natives. As for invalids, an indispensable requirement would be good hotel accommodation. But even if there were any hotel existing, these highly interesting islands, so attractive for the tourist, could hardly be recommended as a health resort.

and made it impossible to make out exactly which bay we were to enter. Several bays, almost identical in appearance, open towards the east, and it was excusable that our steamer entered the Vaagsfjord by mistake. Soon we were noticed by some of the inhabitants, who sent a boat to meet us and to tell us where we were. There was no difficulty after this in entering the bay of Trangisvaag.

We were, however, not permitted to land at once. It happened that the governor of the islands was one of the passengers of our steamer, which had sailed from Copenhagen and called at Granton. In Leith and Edinburgh some cases of small-pox had been reported; hence we hailed from an infected port, and had to fly the yellow flag. Such a

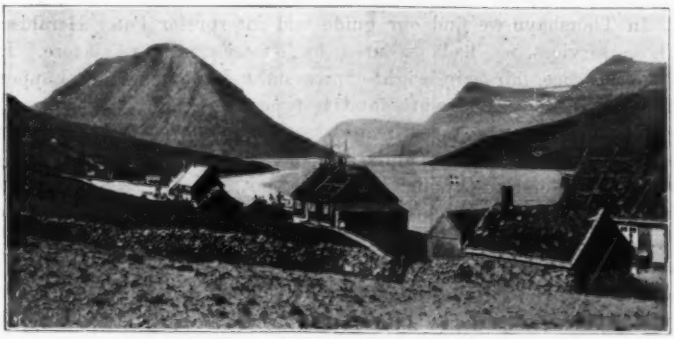

FIG. 2.—BAY OF KLAKSVIG LOOKING NORTH. THE PYRAMIDAL MOUNTAIN ON THE LEFT REPRESENTS THE SOUTH END OF KUNÖ.

precaution may seem over-careful in our own part of the world, but it appears that any infectious disease introduced into the Færoes is apt to spread amongst the whole population with great rapidity and severity. Similar occurrences are reported of other isolated parts, *e.g.* St. Kilda, etc.

The governor, with true consideration for the people in his charge, had, soon after leaving Granton, insisted upon the revaccination of all those who wished to land in the Færoës and had not been vaccinated within the last six or seven years. When, therefore, the doctor of Trangisvaag had visited our steamer and found everything in order, the quarantine came to an end.

As soon as this became known, a number of native boats approached the steamer to receive any cargo intended for Trangisvaag. These cargo-boats are broad and heavy, and are manned by three or four men. When all the cargo had been discharged, the shipping of "export goods" began, consisting almost exclusively of dried fish. This is a somewhat slow process, as almost every fish is handed singly into the steamer. But time seems not very valuable in high latitudes. At last a peculiar piece of cargo had to be taken in, viz. an invalid, who,

suffering from necrosis of the leg, was hoisted on board in a coffin-shaped box well stuffed with bedding. His destination was the little hospital in Thorshavn.

After passing the new lighthouse of Trangisvaag, erected in 1893, we see before us a cloud-capped island rising out of the sea, and appearing, in the glow of the setting sun, like a smoking volcano, the conical "Lille Dimon," one of the rocky isles inhabited only by sheep. As we steam past the cap lifts, and the flat top of the island, so characteristic of the trap formation, becomes visible. The sea is boisterous, and four hours' heavy rolling and tossing are brought to a welcome end on entering the bay of Thorshavn, bounded on the north and west by the island of Stromö, and on the east by the long island of Naalsö.

In Thorshavn we find our guide and interpreter Peter Haraldsen, whose services we had procured by letter some time before. His handsome face, fair hair, bright expression, and general external appearance, make him quite a representative type of his countrymen.

The Færoese are the direct descendants of the Vikings, whose language and amphibious habits they have inherited. Their language is easily understood by the Icelanders, but does not, like Icelandic, possess a rich literature; it is to all intents and purposes only a spoken language.

The Færoese dress consists, for the men, of a peculiar cap, usually of a blue and red striped woollen material, a dark brown woollen jacket, knee breeches, grey stockings, and shoes of undressed cowhide for rough wear, or of dressed calfskin for better wear. These shoes are worn by the natives of both sexes and all ages, and are tied above the ankle with a woollen cord, white for men, red for women. All these articles of dress are home-made from beginning to end. The women's dress shows no characteristic difference from that of our own country. The people have a bright, intelligent look, and often a great deal of beauty is seen, especially in the men and the children.

Arrived in Thorshavn, we paid a visit to our old friend Consul Hansen, who most hospitably placed his house at our disposal, and, with his amiable spouse, did all in his power to make our short stay in Thorshavn pleasant. His house is situated on the rocky promontory which divides the bay of Thorshavn into two unequal parts.

We now propose to take a stroll through the "town." Thorshavn, the capital of the islands, the residence of the governor and other officials, has a population of about 1300, with a big church, a new stone-built school, and the fort. Starting from Consul Hansen's house in bright sunshine, we have before us a characteristic Færoese sight—the rocky ground around the house is used as a drying-place for fish. Fish we find everywhere on such a day—on the little open space on the other side of the bay, on the hill on which the fort stands, and along the shore. On the latter we find women washing and cleaning some that have just been brought to land.

We now enter the main street, a narrow way leading between houses of characteristic appearance. The foundation is very simple, large and small blocks of rock being piled together into a wall; often a huge outcropping rock, planed and scratched by glacial action, is utilized for such purpose, and any interstices in that part of the house-walls are filled by imported mortar. The main portion of the house is made of planks, also imported, and generally tarred. The roof is formed first by rafters; on these the bark of Danish birch is spread and fastened, and a layer of grass sods is placed on the top, giving the roof an appearance of great rusticity.

In this narrow street we found the house of the present "sysselmand" and post-master, Mr. Müller, for many years the representative of his

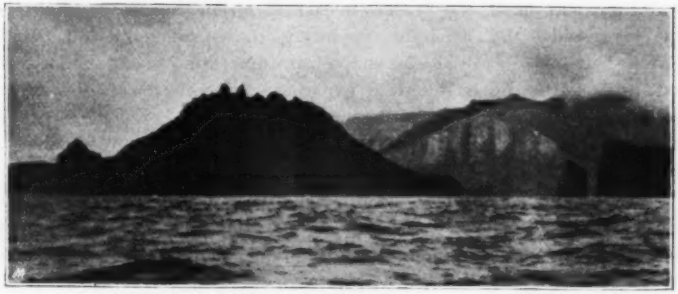

FIG. 3.—TINDHOLM FROM SOUTH.

native country in the Danish parliament. An excellent linguist, he is well known to naturalists by his collections of eggs, birds, minerals, etc.; and he has been an ever-obliging help to most of the few travellers in the Færoes.

Our stroll leads us to a small open space surrounded by houses of unusual picturesqueness. Very striking are the chimney-stacks, consisting mostly of a wooden shaft, sometimes enveloped in straw. Everywhere the windows are large, and hinged so that they can be opened, in this respect contrasting favourably with the houses in Iceland. Often a fine array of flower-pots, roses, carnations, mignonette, etc., adorns the window-ledges; and here and there a small flower-garden, a few yards square, has a gorgeous display of large red poppies, stocks, and other familiar flowers.

Up and down we follow the main street, the houses being built, not to make a terrace, but placed anyhow. Occasionally a "side street" attracts our attention by its picturesqueness: a staircase formed out of the solid rock, leading to a small lath house, which apparently blocks all further progress. These lath houses are used as "larders," in which the flesh of sheep is hung to dry. Exposed to the free access of air,

the meat is soon covered by a dry crust, which is said to keep the inside perfectly fresh and sweet for a long time.

Often we notice long sticks on which rows of fish are strung, forming the drapery of a gable.

The small brook which runs through the town was particularly dry during our visit; a pretty stone bridge leads across. Higher up the brook is used by the women for washing clothes. We found in the rocky bed several round holes, which one of my companions felt inclined to interpret as "potholes," or glacial mills. I was somewhat sceptical about them, and at last elicited a different explanation of their origin. It appears that the Færoese are well acquainted with the dyeing properties of various lichens. After maceration, the lichens are pounded with stone pestles on a slab of rock, and, in order to have water near at hand, the process is carried out on the elevated parts of the river-bed. By constant pounding these pseudo-potholes have attained their present size and shape—an interesting warning not to be led into a trap by a scientific explanation where the possibility of artificial causes are possibly responsible. It may here be mentioned that all their woollen garments are dyed as well as manufactured by the Færoese themselves.

A little further on we see a brooklet bridged over by a grass-covered house, and close by an old water-mill with vertical wooden wheels after the style of a turbine, the water on the occasion of our visit being completely absent. Here we met one of the only two horses that we saw on the islands. The horses, hardly used at all, are very small and shaggy, and resemble Shetland ponies. As there are scarcely any roads at all, and all traffic is carried on by boat, the horse is an encumbrance and practically of no use. The owner of this one, a particularly handsome Færoese, found no market for him when he offered him for sale.

Passing the fine new stone-built schoolhouse, we come to the church. A glance within shows us the spacious though rather bare interior, broken by a balcony. On either side of the altar is an old tombstone, the one to the north with an old Danish inscription, the other with remnants of a much-weathered design. We proceed further and reach the governor's house, a stone building, quite imposing by contrast to its surroundings. Situated on the brow of a hill, it commands a splendid view across the bay, and has the finest garden in the islands.

From there it is not far to the "fort," an insignificant structure which serves as a bridewell. In its grass-covered grounds we see four interesting old cannon, which are now only used for peaceful salutes on the birthday of the King of Denmark.

Opposite the fort is the island of Naalsö, a long narrow ridge stretching from south to north. Naalsö is well worth a visit, especially to the geologist and mineralogist. There is only one settlement in the northern part, Eide by name, a thriving village. On the southern

extremity a lighthouse has been recently erected. An isolated rock south of the lighthouse shows clearly by its profile that it once formed part of the main island; how the eroding action of sea and weather has carved out this rock is well illustrated by the natural arch just below the lighthouse. To this sea-worn perforation the island owes its name, Naalsö being the Danish for Needle-island. It is easy to understand how in time the site of the present lighthouse will be separated from the main portion of the island, and form a stack similar to the one now existing south of it.

In the south-east corner of Naalsö we find the peculiar rock formation mentioned in the introduction.

FIG. 4.—MYGGENÆS—LANDING-PLACE WITH BOAT.

We now visit the eastern group of islands, and start from Klaksvig, a small but important settlement on the island of Borö. Klaksvig is situated in a well-sheltered fjord, difficult of access for a large steamer, but well protected against rough weather (Fig. 2). The settlement consists of a number of houses mainly on the western side. Towards the north the pyramidal end of the island of Kunö forms a stately background, showing clearly the horizontal layers of the trap formation. Looking south-south-east up the fjord, we see the end of the bay formed by a low isthmus, a col, on which are situated the church and the schoolhouse. A peculiar feature in the village is a long wall, reaching down from one of the houses to the water's edge. This

wall attracts our attention at a distance by a number of regularly distributed white spots, which, on nearer approach, are found to be the skulls of the small whale called "Grindeval"—*Globiceps melas*. This whale measures four to six yards in length, and occasionally visits the fjords in large numbers, where it falls a prey to the united strength of all the available male population of the islands.*

After exploring the Klak, the mountain above Klaksvig, where some fine specimens of opal were collected, we prepare for a visit to Svinö and Fuglö. Crossing the isthmus, we meet the boat and crew awaiting us already. In fine weather such a sail is delightful. The boats are built with stem and stern alike for convenience in landing, and are manned by six, eight, ten, or twelve men. The oars are long, with narrow blades, not more than 2½ inches across, and are fixed with thongs of dried whaleskin, so that they do not feather. The reason I heard given for this was that during the long stretches of rowing—sometimes six to eight hours without stopping—feathering would be too fatiguing, and the narrowness of the blades reduces the resistance of the air to a minimum. A sail, in some cases two, can be set; but it can only be used when the wind is in a favourable quarter.

A glance at the coast-line shows that, in case of capsizing, no possibility of escape would be left, the islands being mostly girt by overhanging cliffs extending for miles. Keeping well inshore owing to the tidal currents, this part of our journey would have been somewhat monotonous had we not had frequent opportunities, just there, of watching the behaviour of that peculiar bird of prey, the lestris. This gull, unwilling to dive into the water for its own food, closely watches the graceful tern, *Sterna arctica*, and, as soon as it sees the latter catch and swallow a fish, it persecutes and frightens the bird until the fish is disgorged and dropped, the lestris catching the dainty morsel while still in the air. Though disgusting for more than one reason, the whole act is done with such surprising skill that one cannot help admiring the mean robber for its adroitness.

After a few hours of hard rowing, we reach Svinö from the south-east. The little village is situated on the slope of a col between the two blocks of mountains which form the island. Ample traces of glaciation are found on this isthmus—moraine hills, boulders, roches moutonnées—all more or less well preserved. Fairly high up is the church, a building much larger than we had expected to find in that secluded spot. It has a fine altar-piece, copied from a well-known modern Danish picture.

* For want of time, I cannot here enter into the mode of capture employed. I may, however, mention that the number of whales caught seems greatly exaggerated in the descriptions given of late. In a recent paper (*Verh. der Ges. f. Erdkunde zu Berlin*, 1894, No. 6, p. 324), Prof. Moebius gives the number of globiceps caught in the Færoes annually as 50,000, whereas the actual number caught during the ten years from 1885 to 1894 was 4873, or about 480 per annum.

In spite of the heavy fog which descended on Svinö, we tried a visit to Fuglö, the easternmost island. From the distance we just recognized through the mist the form of a broad cirque, steep on all sides, and accessible only at its apex, where it touched the sea-level. When nearing Hattervig the fog lifted, and revealed the great height of the eastern cliff, the western cliff being not much lower. The landing was not quite easy, the harbour being a sloping rock surface of uneven amygdaloidal basalt, intersected by numerous dykes, and rich in zeolites.

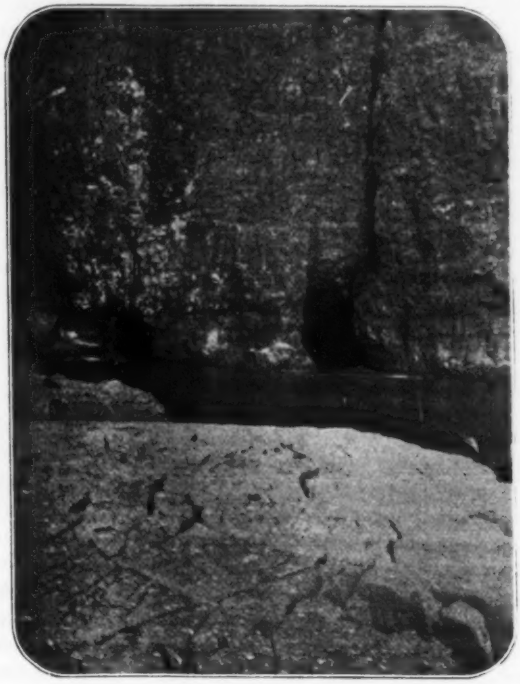

FIG. 5.—CLIFF SOUTH OF SAXEN (STROMÖ), SHOWING THE WEATHERING OF DYKES AND FORMATION OF CAVES.

From the harbour a grass-covered slope leads to the village. The little church, like most Færoese churches—even the very smallest—has two entrances, one on each long side; not so much with a view of easy access, but in order to keep the weather side closed on the frequent occasion of stormy days. The village itself is of primitive appearance, some of the houses looking somewhat like earth huts. There are better houses as well, *e.g.* the house which gave us most generously that hospitality which is such a pleasing feature for the traveller in every part of the Færoes. This house has, perhaps, the most picturesque of

the many quaint rooms we saw in the islands. It is a sort of kitchen, a large square room, the ceiling low, the floor of earth; along three sides of the room are seats with beds let into the wall; the fourth side is occupied by a huge hearth with beds on both sides. In the centre of the hearth was a wooden box, about four feet square, half full of ashes, and used as a fireplace. Over the glowing turf hung a kettle, suspended by a rope from a beam span across the primitive chimney. All sorts of foods were suspended therein to dry in the smoke, while a large assembly of the family and their friends sat chatting round the fireplace.

On our way back we found the skull of a grindeval and other parts of the skeleton. Not very far from the landing-place we noticed, fairly high up on the rocks, large pieces of driftwood, one completely riddled with teredo borings while floating in the ocean.

In this, and also in a few of the other islands, a peculiar kind of anchor is used, made of a large piece of basalt rudely hewn into a four-sided prism. The flukes, four in number, are formed of two long iron rods bent into appropriate shape. They are very interesting, inasmuch as stone anchors are not frequently used in other parts of the world at the present day, *e.g.* on the River Plate; they have evidently been introduced into the Færoes by the Vikings.

We now leave the eastern group and turn towards the west. Our goal is Myggenæs.

The difficulty of visiting Myggenæs consists in the almost complete inaccessibility of its shores. Only under most favourable conditions of weather and wind can a landing be accomplished, and that solely at one single point near the western end of the south coast. So uncertain and dangerous is the process of landing there, that occasionally, after landing has been effected, it may be impossible to embark again for three or four months. This interesting prospect was, however, in our eyes only an additional charm to the many attractions of Myggenæs. On the morning of our intended journey the weather was not favourable. The sea was running high, and our boatmen did not dare to row us from Leinum out into the open sea, and only brought us across the fjord, so that we had to walk overland on the island of Vaagö until we reached Midvaag. There we secured a bold and muscular crew of eight men, who promised to try how far they could venture. They did not give us much hope of reaching Myggenæs, still less of being able to land. The scenery along the south coast of Vaago is very imposing with its vertical or overhanging rocks, *e.g.* Trelle Nypen. We pass the Busdali-foss, the largest waterfall in the Færoes. The water, the outflow of the largest lake, "Sörvaagvatn," falls in a few cascades over the layers of basalt, forming a regular staircase. From time to time the ocean swell sends up the foam of its breakers from below to meet the waterfall halfway. Owing to the state of the tide and wind, we have to leave the shore

and row out to sea. In the misty distance we see Myggenæs before us, rising out of the water dim and mysterious. As we come nearer after a few hours of persevering rowing, we perceive the western extremity to be separated by a narrow crack from the main island, and we now steer straight towards that point. At last we approach the harbour, a small bay opening south, and bound on east and north by perpendicular cliffs about 80 feet high, while the western side is formed by steeply sloping seaworn rocks, over which the furious waves break in white foam. Our boat had been observed from the island, and when we neared the harbour the natives had gathered on the top of the vertical cliff (Fig. 4) and shouted to our crew. The roar of the surf made it impossible

FIG. 6.—DRANGAR AND TINDHOLM FROM NORTH-EAST, THE UPPER SURFACES GIVING PROFILE OF CIRQUE.

to understand what they said, but Peter translated their gestures by informing us that it would be necessary to haul us up the cliffs by ropes—a performance which we did not quite fancy. At our request our men tried again and again to land us on the sloping rock ledges, and finally this was effected with the help of some of the natives. We were pushed or rather thrown out of our boat one at a time by our men, and received by the natives on the rocky ledge. In this manner we set foot on Myggenæs, not quite dry, but certainly much less damp than we might have expected.

After we had landed, the men had hard work to get the boat on the rock, the waves dashing high up and threatening to pulverize our little craft; but finally the *Friggjarin*—that was the name of our boat—was safely landed and drawn about 80 or 100 feet up the rock, so as to be safe from any sudden squall that might spring up.

Thus at last had we gained Myggenæs after twelve hours' struggling;

when it would be possible to return nobody knew. Nor did we much trouble about that for the moment; we had safely landed our cameras, barometers, and other goods, and so far we had no cause for complaint. As it was already late, we had only a short ramble in the immediate neighbourhood of the village, the only settlement on the island, situated some 200 feet above the sea and near the landing-place. It comprises about 30 houses grouped round a pretty little church, and sheltering some 150 to 200 souls.

On the following morning the weather had become beautiful, a clear sky and a bright, warm sun giving great charm to the grand lonely scenery. In favourable light the harbour was photographed, and then we set out on a systematic examination of the island, with the desire to reach the highest point in order to take the barometric reading.

As we ascend we see below at our feet towards the west the island of Holm, separated by a narrow gap from the main island. The cañon-like gap which separates the two is spanned by a wire rope on which a cage runs, for the convenience of the men when looking after their sheep. In all probability this gap owes its origin to the removal of a dyke which formerly occupied that site.

Plenty of sheep enjoy the short but fine grass on the south-western slope of Myggenæs. At a height of 900 feet we get a glance at the magnificent coast scenery of the northern shore. The thick alternating layers of lava and tuff have a greater dip in Myggenæs than in any of the other islands, the dip reaching 18° in the western part. These rocks form nearly vertical walls, that make landing utterly impossible. Many a fine stack, 200 or 300 feet high, stands like an outpost a little distance from the cliffs, testifying to the destruction which goes on there continually.

Large colonies of sea-birds inhabit the rocks, puffins being plentifully represented in this locality. They are quite tame, and are not frightened when approached within a few yards.

Ascending still higher, we find an intrusive sheet of basalt 60 to 80 feet thick. The columns are certainly the finest we saw in the Færoes. Reaching the summit of Myggenæs, our exertions are rewarded by a magnificent view. Toward the north-east, the cloud-covered cliffs of Stromö; to the east, the western bay of Vaagö, the Sörvaagsfjord, with Tindholm and Gaasholm in front of it; then further, almost lost in the blue haze of the horizon, Sandö, Skuö, Store Dimon, Lille Dimon, and lastly Suderö.

The barometric reading, compared afterwards with sea-level, gave an altitude for the summit of Myggenæs of 1750 feet.

Towards the east a magnificent cirque lies beneath our feet, and we can see from our position that the coast is as inaccessible on the south side as on the north.

Signs of glaciation were noted up to a height of 1500 feet. Above

that the rocks are craggy, and angular fragments of stone fallen from the higher points are scattered in profusion. Just above the limit of glaciation a bed of brown soily substance, 10 to 15 feet thick, and strongly impregnated with humus, forms the surface; the grains are extremely small and regular, and no traces of big fragments—not even as large as a pea—were noted. A rude attempt at stratification could be made out, not very pronounced. This soil has probably been formed by chemical disintegration of the basalt rocks *in situ*.

At an altitude of 1300 feet we found coal in small quantities; also again at a much lower level, close to the landing-place. The inhabitants

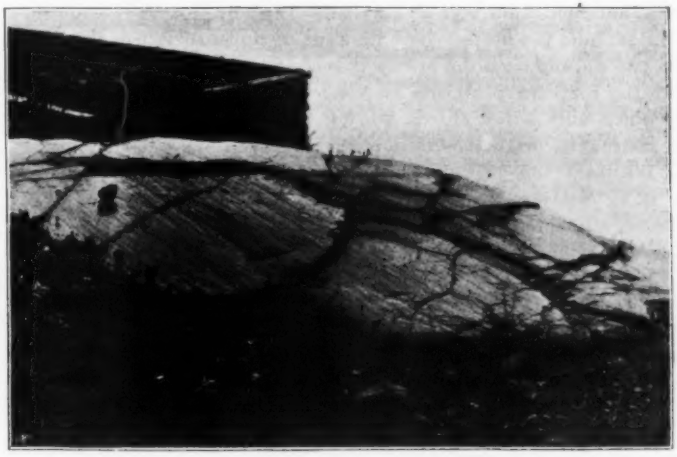

FIG. 7.—GLACIAL STRIÆ AT TRANGISVAAG.

brought us fairly large pieces of coal found by them at the bottom of a cliff on the southern coast; this coal is highly glossy, and breaks with conchoidal fracture.

The day being so fine and favourable for embarking again, we thought it wisest to seize this opportunity of returning to Vaagö, as we did not relish the idea of remaining in Myggenæs for an indefinite time.

Thanks to the perfect day, we found the embarkation much easier than the landing on the previous day. With the help of the swift tidal currents, Myggenæs was soon left behind, and we reached the fantastic-looking island called Tindholm (= tooth island) (Figs. 3 and 6). On the previous day we had seen it at a fair distance from the south, the Drangar, or stacks, eastwards. This day we passed on the north of Tindholm, in close proximity to the island. Not a breath of wind could be felt. Nevertheless, the tidal currents were sufficient to toss our little boat up and down so much that it was hardly possible to stand up or to take any

photographs. The scenery was, however, too fascinating not to make some attempts, which happily turned out successful. The profile of Tindholm resembles the tooth of a saw, and its serrated upper edge, seen broadside, equally justifies the name given to the island.

It requires enormous exertions to force a little open rowing-boat through the powerful mælstrom on this rocky coast, but our men are experts of no mean order, and we pass safely the two Drangar, huge stacks separated from Vaagö by the eroding forces of sea and weather. One of these stacks is narrow; the other, broader, is already perforated by a natural arch, and will ere long become divided into two stacks, and in time share the fate of complete destruction with Tindholm, Gaasholm, and finally the rest of the islands (Fig. 6).

Both from the north, where the slanting upper surface of these stacks can be seen, and from the profile, it is clear that Tindholm, the Drangar, and the southern peninsula of Vaagö, formed once one large cirque, of which only a few shreds are left standing—sufficient, however, to reconstruct its original form in our mind's eye.

We leave this part of the Færoes—possibly the most picturesque, as it is certainly the least known—and, after passing the Witch's Finger, a pointed rock separated from the parent cliff by a vertical rent, and looking ready to fall into the sea, we reach Quivig, on Stromö.

Journeying on land, we come to the beautiful Leinum lake, perfectly circular, and situated in a district rich in exquisite zeolites. In the background of the lake is situated a high mountain reputed for its wealth of opal, both common and fiery. Unfortunately, our limited time did not allow us to verify this report.

High up, to the south-west of the lake, the large basaltic intrusive sheet of Skellinge is seen. A little to the south-east of Leinum lake, the summit of the col is reached. This point is situated on the main parting-line of ice and water mentioned in the beginning of this paper. Not very far off we find a huge boulder left by the ice close to the watershed, which it is hardly possible to mark out with exactness on the flat-topped col.

The farm at Leinum is in a well-kept condition. Our attention was attracted by a fine specimen of hand-quern which we saw in actual use. These querns were met with in various places, *e.g.* Thorshavn and Svinö.

From Leinum we take a boat, and, within view of the islands of Hestö, Kolter, and Vaagö, we row northwards to the bay of Vestmanhavn, which forms the finest harbour of the islands. The coast-line is sloping and well covered with grass; a brook tumbles down in gentle cascades on the south-east side of the bay. The tidal whirlpools in this fjord are very remarkable. I noticed in several places large circles, about 30 yards in diameter, perfectly smooth, their level nearly 6 inches above the surrounding water. At the circumference of these smooth

plaques a regular cascade was formed, where an equalization of the level of the water was attempted, without success, owing to the great force of the inrushing tide.

From Vestmanhavn northwards, along the western coast of Stromö, the most imposing cliff scenery of all the islands is seen. For many miles the rocks rise perpendicularly out of the sea to a height of between 1500 and 2400 feet. All along these miles of vertical cliffs, each of which presents a magnificent geological section with every detail of structure recognizable, there are not more than two or three spots where a rowing-boat can land or a foothold be found in fine weather. Even then there would not be the slightest chance of scaling the cliffs; while in rough weather landing is altogether out of the question.

These cliffs are the nesting-place of countless myriads of sea-birds. Already from a distance their presence can be recognized by the white patches, denoting the abode of the terns, kittiwakes, puffins, gulls, alks, etc., which, on our nearer approach, fill the air with deafening cries. The more or less horizontal strata of the rocks are of various degrees of hardness; the softer parts weathering out, ledges and hollows are formed which are used by the birds as nesting-places. The birds often crowd together to such a degree that it seems as if there were no room left for a single bird more. These bird-rocks form a valuable property for the parish to which they belong. At the time of hatching, the men band together and go fowling on the cliffs. This is a most dangerous occupation, and it is no wonder that many of the strongest and healthiest of the population fall a victim to it every year. Three or four of the men approach the top of the cliff from the land side; then one of their number is let down by a rope, and, half dangling, half crawling, he reaches the birds' habitat. Then, with a large net fixed on a pole, he rakes out of the nests whatever he can reach. The frightened birds become entangled in the meshes, and are caught by the fowler, who twists their necks and throws them down into the water, where they are picked up by boats in waiting. In this way, thousands and thousands of birds are killed and stored away as food for the winter. This is the only way they are caught; shooting is carefully avoided, lest the report of the guns should frighten them away altogether. We were fortunate enough to witness this bird-catching in various parts of this coast; also in Myggenæs, Svinö, and Naalsö.

The west coast of Stromö gives excellent opportunities for studying how the erosion by sea and weather takes hold of these gigantic walls, which look as if built for eternity. The caves, which are produced at the sea-level by the washing out of dykes and cracks, have often most fantastic forms. Sometimes they are arched like a Gothic vault, resembling Fingal's cave or Nuremberg architecture; in other parts we see a flat horizontal roof covering mysterious inlets, reminding us of the entrance to the lethal chambers of the Pharaohs. In many of

these caves seals used to breed, but the irrational way in which the natives slaughtered them has finally driven them away altogether.

As we row further north we encounter many a fine example of rocks that have broken off and slid down as stacks, which are now separated from the main rock by a narrow rent barely wide enough to admit our small boat. A visit to the interesting old harbour of Saxen was carried out under some difficulties. It is now so completely silted up that even our little craft could not enter more than a hundred yards, and we had to wade through the banks of finely ground grains of basalt; not a grain of quartz could be found in spite of careful searching.

At last we see before us the steep cliff of Myling head, at the northern extremity of Stromö. To the west this cliff drops into the sea as a straight wall nearly 2400 feet in height, while its eastern side is formed by the gentle slope of a beautiful cirque, dipping to the level of the fjord at Tjornevig, whence it can be scaled without danger.

Rounding this corner, we enter the fjord of Eide, where fine examples of roches moutonnées and striæ are seen on every hand.

Eide, a flourishing settlement on the north-western point of Osterö, has a fine church, and is one of those places where we found exquisite apophyllite and chabasie. From Eide we went up the fjord to Nyboder, where a Norwegian whaling station had been erected that summer. As the steamer was just out at the time of our arrival, we proceeded temporarily to Qualvig (= whale bay), a little further south on an inlet of the fjord. In this large bay there happened to be four "bottle-nose" whales which had strayed there, and were evidently in no hurry to leave. Most likely they had found an abundance of food, which had attracted them. When we arrived they had been there three or four days already. Northwards they could not escape, the "sund" being too shallow for them; and, as they had made no attempt to leave by the southern part of the fjord where they had entered, a large schooner had come from Thorshavn to capture them by means of a ridiculously small rowing-boat and a little rocket-harpoon. Needless to say, the efforts of this boat proved unsuccessful. The mode applied for the capture of the globiceps could not be applied; the nets with which the grindeval is imprisoned within the fjords are far too weak for such big game as the bottlenose, and would have been completely destroyed without hindering his escape in the least.

In Qualvig we had an opportunity of studying the interior of an old-fashioned well-to-do Færoese house. Very quaint is the stove—an iron box built through the wall of an adjoining room or kitchen, where it is fed, so as to heat both rooms with a minimum amount of fuel, which here, as almost everywhere in the islands, is peat. We often saw men carrying peat on their backs in big lath boxes, supported by a broad strap across the forehead. The beds in these farms are also noteworthy. Often they are let into the walls like berths in a ship,

after the Icelandic style. Similarly, we found they were capable of being telescoped; but while in Iceland the beds can be made shorter or longer, the Færoese beds, always rather short, can only be altered in width, being thus adapted to the inordinately spare or stout rather than to the short and tall.

From Qualvig we returned to Nyboder, where we joined the whaler. We went out with the steamer *Urd* on a three days' expedition, and were successful in harpooning and bringing home one of the largest specimens of the great fin whale (*Balænoptera musculus*). As, however, time is already too far advanced, the details of this exciting chase cannot be gone into to-night.

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Before the reading of the paper, the President said: There are probably several here present who will remember the agreeable evening which Dr. Grossmann gave us, now nearly two years ago, when, by means of his photographs, he conveyed to us such a very vivid picture of the Icelandic scenery, and brought out some salient points in the geology of Iceland. I think we may anticipate an equally pleasant evening now, while obtaining a knowledge of the Færoe Islands through Dr. Grossmann's photographs and his graphic descriptions. I will now call upon Dr. Grossmann to read his paper.

After the reading of the paper, the President said: I think the meeting will agree with me that I was not a bad prophet, and that we have spent a very interesting hour in making the acquaintance of the Færoe Islands. There are many points in what Dr. Grossmann has said which might lead to discussion, but I regret to say that Sir Archibald Geikie, who has for two years running visited these islands, is unable to be present. He has, however, written down what he intended to say, and has sent it to me. I think it will interest the meeting.

Sir A. Geikie's communication: For two summers in succession I have visited these islands, and as I made the voyage each time in a steam-yacht, I have been able to circumnavigate the whole group, and to explore the greater number of its islands and fjords. Dr. Grossmann's paper recalls my own experiences and revives the very pleasant impression which both the islands and islanders have left on my memory.

The Færoes have a singularly uniform geological structure, and consequently a somewhat monotonous character of scenery. They are built up of level or gently inclined sheets of volcanic rock, which, however, is not "volcanic tuff," as the author of this paper seems to believe, but streams of once molten basalt. The tuffs, as in our own Hebrides, form a quite insignificant part of the whole volcanic series. These ancient lavas were poured out from numerous small vents, and not from any great central cone like Vesuvius. I was fortunate enough this summer to discover a row of these little volcanoes at the base of the western cliffs of Stromo.

There can be no doubt that, like the corresponding rocks of Antrim, Mull, and Skye, the lavas of the Færoe Islands were erupted on a terrestrial surface. They flowed over a wide plain, which they gradually heightened until its original bottom was buried under more than 2400 feet of volcanic material. The rainfall during that prolonged volcanic period was perhaps not very different from what it is in the same latitudes now. At all events, there was moisture enough to nourish abundant land-vegetation, and to fill with water the little hollows on the surface of the cooled lava-streams. Into these pools and lakes leaves from the surrounding woodlands were blown by the wind or washed by the rain, in such abundance as to gather among the silt of the water-basins into layers that became in the end beds of coal.

Eventually this wide plain or plateau of volcanic material sank down to some extent, so that its base is now concealed under the sea. Though I have diligently searched all round the Færoes for the original bottom or land-surface on which the basalts lie, I have never succeeded in finding the slightest trace of it. It has been entirely submerged.

But the most serious changes which have been wrought on the face of the Færoe plateau have been effected by the various agencies of denudation. By degrees its edges have been cut back until they now rise as stupendous precipices from the level of the sea. Its surface has been eroded into valleys, and as these have been depressed with the general sinking of the whole area, many of them are now occupied by the sea and form fjords.

These northern islands are thus a mere fragment, which has been cut into smaller fragments by the ceaseless progress of denudation. Their varied forms of surface are entirely due to waste, modified by the guiding influence of the rocks; and as these rocks are so uniform in character, the resulting topography naturally

remains constant throughout the whole group. So far as I have been able to ascertain, no rocks such as the gabbros and granophyres of Mull and Skye, which might have given a central core of high ground, with different features of scenery, have broken through the basalts of Færoe. The islands have no mountains, in the proper sense of that word. Their highest ridges are merely portions of the same universal plateau made up of nearly horizontal lavas. The endless straight bars of rock-terrace, so conspicuous along the coast cliffs, may be traced even to the loftiest summits of the interior.

There is one notable difference between the Færoe Islands and the Inner Hebrides. Owing, perhaps, to their more northerly position and climate, their sea-cliffs are less mantled with vegetation than our verdurous islands, and afford, therefore, more continuous sections of their geological structure. I have never seen such colossal precipices of volcanic material as those of the north-eastern islands—vast walls of naked rock, where every lava may be counted from the waves below to the beetling crests more than 2000 feet overhead. And nowhere in Europe are the lessons of denudation more eloquently enforced. At every turn new proofs meet the eye of the stupendous erosion which, out of an original plain of lava, has slowly excavated these fjords and sounds, sliced down these precipices, carved out these buttresses and alcoves, isolated these sea-stacks below and these cloud-capped pinnacles above. Apart from the interest of their volcanic history, these islands well deserve a visit from every geographer and geologist who would wish to witness with his own eyes the most impressive memorials of topographical changes, and to realize—yet more vividly, perhaps, than he has ever been able to do before—how gradually the scenery of our globe has been evolved, and how large a part of this evolution is due to the winds, rains, and frosts that seem to act so feebly in the sculpture of the land.

Dr. Grossmann gives a pleasant and faithful picture of the Færoese islanders. They are, as he describes them, fair-haired, blue-eyed Vikings, accustomed from their boyhood to live on the sea, daring climbers, active and intrepid boatmen, frank, helpful, and industrious, building many a bright and busy homestead in their sheltered creeks, and, in spite of the hardships entailed by a boisterous climate and a rugged and rocky soil, gaining a livelihood in contentment and peace.

The PRESIDENT: We have to thank Sir Archibald Geikie for so kindly sending us what he intended to say. I also regret that our old friend Colonel Feilden has written to say that he is unable to be present this evening. There are reasons for believing that there is a very extensive volcanic area extending from the Færoes and Iceland over the sea-bed towards Greenland. I remember, when in the *Valorous*, a line of deep-sea soundings was taken from Davis Straits to the coast of Ireland, and our average depth was 1700 to 1800 fathoms, with soft sand and globigerinous ooze. One day, on an Icelandic meridian, but far to the south of that island, we came upon a depth of only 690 fathoms, and brought up bits of volcanic rock, so that there was evidence of a mountain 7000 feet high, rising from the surface of the sea-bottom. I think it would be extremely interesting if a careful survey could be made of the sea bottom between the Færoe Islands, Greenland, and Iceland southwards to about the 55th or 54th parallel, so that we might have a knowledge of the configuration of the sea bottom over that area. We should probably find a series of volcanic mountains reaching to within 500 or 600 fathoms of the surface. There are many other points of great interest which have been told us by Mr. Grossmann, but I should have been glad if he could have given us more particulars of the fishing of the Grindeval when those whales come up the fiords. We have only now to pass a vote of thanks, which I am sure you will all cordially do, to Dr. Grossmann for his very interesting paper, and I am confident that you will instruct me to convey to him your warmest thanks.

JOURNEYS IN PERSIA (1890–91).*

By Captain H. B. VAUGHAN, 7th Bengal Infantry.

On arriving at Linga, I started in a native boat of five tons and sailed up the Clarence Straits between the mainland and the isle of Kishm. On the second day we arrived at Bandar-i-Khamir, a small port, near which are immense mangrove swamps. The inhabitants said that the salt river from Jena found its way into the swamp about 12 miles to the south-east of the town. Next day we resumed the voyage, and ran up the mouth of a salt river to the east of Khamir. This river is said to rise near Iskhanan, and flows past Fathura down to this point, and the river Dundil from Hormuz is said to join it just before it reaches the sea. The banks and flats of mud here were covered with thousands of sea-birds, varying in size from the adjutant down to the sandpiper. The return journey took us three days; then a gale sprang up, so we landed at Kung and marched into Linga, a distance of 4 miles. At Kung were the ruins of an old pirate stronghold, said to have been destroyed by our ships many years ago.

On April 12, 1890, after a stay of some days at Linga, on the Persian Gulf, I left it with a caravan of one horse, ten donkeys, two servants, and one Persian soldier. We marched for three days along the sea-coast, sometimes on the sands near the water. The shore was covered with myriads of large light-coloured crabs, which scurried away in a swarm before us into the sea, to emerge again after we had passed by a short distance. They looked like a hare moving over the ground when about 50 yards off. These crabs dig holes in the sand just about high-water mark, and pile up the excavated material in a small column in front of it. They spend part of their time in the holes. Passing the villages of Bostaneh and Mughu, which latter used to be one of the stations of the East Indian Squadron, we arrived at Charek, another village inhabited chiefly by fishermen, and then struck inland in a northerly direction, following up a watercourse through the mountains.

In two days we descended on to a plain and arrived at Jena, containing about 800 houses, and situated on a plain 1300 feet above the sea. I was met some miles from the town by the Khan of Bastak's servants, bringing with them their master's horse richly caparisoned with silver ornaments. I told them I couldn't ride on a Persian saddle, and they said that he would be much offended if I didn't. So we compromised matters by putting my saddle on his horse. Leaving the town, we arrived at the salt-water river Maheyrun, which flows into the sea at Bandar-i-Khamir. It was in flood, 70 yards broad, and very swift; so we stuck a stick in the water to mark its fall, and sat down to breakfast. In an hour's time we found it was falling

* Map, p. 124.

rapidly, and in another hour we transferred the baggage from the donkeys to the backs of some horses, and got it across dry; the donkeys swam over. Next day we arrived at Bastak, described in my former paper. The number of inhabitants is larger than that of Jena, but smaller than that of Lar, probably between three and four thousand. The governor met us with a large retinue of armed attendants outside his house, to which we adjourned, and was very friendly, as we had met before. The height of the town was about 1600 feet.

After a week's halt we left for Lar, and on the way passed Fathura, a village where there are sulphur springs which are at a temperature of 103°. The inhabitants said they were very poor, and that in winter they used to sleep in the stream to keep themselves warm, and in proof of this assertion pointed out stones in the water which they used as pillows. The march then lay up a valley near a river, on which stood Anwe, a village close to which are some flour-mills worked by a sulphur spring on the river's bank. The fish I noticed were all black. I shot several, which were good eating. I don't know whether their colour is attributable to the sulphur or not. The river, or rather stream, in question is said to come from Iskhanan, and to flow past Toderu into the sea near Khamir. We started next morning from Anwe with an honorary escort of fifteen musket-men and two of the khan's servants; crossing a pass we entered the Lar district, and marched over a plain to Hormuz, where we halted. My escort were all Sunnis, and the villagers inhabiting this and those to the north were all Shiahs. As I arrived with them, I was looked on in an unfriendly way, and until I had talked to them for some time and showed them my letters of introduction to the Governor of Lar, they would do nothing for me. Close by the town were the ruins of a city built of stone, which must have contained several thousand inhabitants. There is another Hormuz, a village on the road to Forg, and also the famous Hormuz near Bandar Abbas. After marching two more days through mountains, we arrived on the Lar plain, where a body of mounted horsemen met us and conducted us into the town, discharging their rifles and performing various feats of horsemanship as they circled in front.

I stayed in the Mehiman-Khana, a guest-house of the governor, who was Fateh-Ali-Khan, of about seventy years of age, a fine old man, with three grown-up sons. The town contained about 6000 inhabitants, of which 300 were Jews, which latter appeared to be in a state of great poverty and raggedness. There was a very fine bazaar built by the present khan, and a new caravanserai, also a Persian post-office. The great mosque was said to be 600 years old. There are a great number of old stone ruins about the place, amongst which are two fortresses and numerous aqueducts, all of masonry, and attributed by some to the Zoroastrians. There were a great number of date palms about, and some cultivation The governor was ill when I went to see him, and

I gave him some medicine to take. A Szed standing by said, "Don't take it; it may be poison." The governor simply looked hard at him, and replied, "What should he want to poison me for? What good will it do him? I will certainly drink it, provided it contains nothing forbidden in the Koran;" and on receiving this assurance took it. The only other Europeans remembered to have visited the place were Mr. Stack, Indian Civil Service, and I think a Mr. Butcher, of the Indian Telegraph.

After a week's stay as the governor's guest I left, and marched for Darab. My muleteers were all impressed by the governor, and on the second day we arrived at their village, Dah-Kuh, where I halted to let them cook food for the road. They were very anxious to stop and assist in gathering the harvest. A servant of the Khan of Lar here overtook me, with a couple of monkeys and a parrot he was taking to Darab for the governor's child.

In two days we arrived at the plain of Yezd-Khast, 3900 feet above the sea, where there was a large camp of a tribe of that name. As I rode up to the camp I saw there were nothing but women in it, and was told that the men had gone to the east to settle a dispute with some villagers. There are said to be extensive ruins near here. Next day we reached Hajiabad, after crossing a pass 4400 feet. The road was then over a plain about 3650 feet in height. On this for half a mile we passed through extensive ruins, amongst which were those of a fort; then on through camps of the Baharloo tribe of Arabs. We next crossed a river called the Rud-i-Ax-i-Rustam, which rises in a pool under a rock sculpture of Rustam, a few miles to the east of Darab. A masonry bridge called the Pul-i-Kosu was our means of passage. Here I said I would halt. On hearing this the muleteers swore and tore their clothes and jumped on their caps, saying I must be mad to halt in such a place, the scene of a battle only two years ago, and haunted by the ghosts of the slain, to say nothing of the Baharloos living close by; if I liked, they would leave the baggage and go on with their mules, but sleep there they would not. So I gave in, and marched on to a village on the same river, but on the Darab plain. This river is said to flow on to Fadumi, where it emerges from the hills as a salt river, and joins the one from Forg. It appears to round the northern extremity of a watershed consisting of mountains, and extending south as far as the Lar plain. Next morning we passed Kaleh-Darab, where there were some ruins on a high mound encircled by a very deep and broad moat full of wild duck; the moat is in the form of a perfect circle, and getting on for a mile in diameter. It is said to have been built by King Darius.

Darab is a large town of about 6000 inhabitants, situated at an elevation of about 4000 feet above the sea-level, on a fertile plain, and at the south foot of a great range of hills. There were a great many ancient remains in the neighbourhood, amongst which were the Ax-i-Rustam, a sculpture in high relief, which appeared to be Grecian, and

probably represents Rustam receiving the submission of some conquered people. The most remarkable feature in it is a chariot with a pair of horses of the antique type, from which a bare-headed individual clad in a tunic reaching to just above his knees has descended; he wears rather closely fitting pantaloons, which are quite tight at the ankle, and is attended by a crowd of clean-shaven, bare-headed, close-cropped, and almond-eyed individuals. Rustam, who is mounted on horseback and wears a helmet with a flowing plume, is placing one of his hands on this man's forehead. Behind Rustam are a crowd of people with long beards, who wear the Phrygian cap.

The horses, as well as the human figures, are well delineated, the various muscles being correctly shown, and the folds of drapery well executed. A large pond of very clear water full of springs lay beneath it, and in it lay fish of 10 or 12 lbs. which refused to take any bait whatever. The Mohammedan New Year's Day, *Nau-Roz*, was celebrated during my stay, and there was continual music in the shape of large drums and colossal foghorns, which played from the central tower just above my rooms. They also played during the night of my arrival, commencing at 11 p.m. and going on far into the night, but I was so tired that, as I told the governor in the morning, I had heard nothing. The governor was a Shirazi and most friendly, as was his son, with whom I used to go out shooting. He could shoot bustard from his horse while going at full gallop past them. A reception was held by the governor on New Year's Day, which was attended by all the leading inhabitants, who read addresses, and at which the troops in the station were drawn up and inspected.

Leaving the town, we marched over mountains for three days, ascending to a height of 7800 feet. At the twenty-eighth mile we arrived at the Kuh-i-Rudbar, where the river of that name rises in an immense cleft in the hills between cliffs 700 feet in height. The ground near on our arrival was covered with hundreds of tortoises, which soon hid themselves in the adjacent bushes. This river emerges on to the Darab plain, and is quite distinct from the Rustam river, and flows, I heard, in a south-western direction. Arriving at Niriz, I learnt that my former acquaintance the governor was no longer there, having been sent a prisoner to Shiraz, as his revenue was short. From Niriz I marched nearly due north, and in five days reached Herat-i-Kharah, a town containing about 1700 inhabitants, situated on a great plain 5800 feet above the sea. All the people, from the governor downwards, were the civilest and most obliging I ever met in Persia. I had a telescope with a 3-inch object glass set up, and the inhabitants used to crowd down every night to see the moon through it, and the excitement amongst the people was so great that even the governor's harem, closely veiled, were allowed to come down and look at what they were told were its mountains.

Leaving the town, we continued the march over the plain, passing

through the villages of Ab-Ali, Hara-Wajun, and Hashimabad. Leaving the latter, we descended slightly, and at an elevation of about 5400 feet crossed a strip of *kavir* one mile broad, and draining south-east on to the great plain of that nature where Robat lies. Next day we marched to Chah-Mil, a noted haunt of robbers, who lie in wait in the surrounding hills for caravans. We numbered six altogether, and as I had guns for the whole of them, the sight of us would have probably been enough to frighten away anybody expecting an easy capture. It got dark before we reached our halting-place, and the party, according to the custom of the country, let off an occasional shot and shouted at the tops of their voices as we approached it.

Halting for the next day at the spring, we started in the evening and reached Kalvand, a small fort, before dawn, at an elevation of about 6000 feet. Three more marches along the high-road from Kerman brought us to Yezd, where I was met by some Parsi friends, and in a procession headed by a mace-bearer and some of the governor's servants entered the city. The changes since my last visit in 1888 were few in number, and I lodged in the same garden house belonging to Ardeshir-Meherban in which I had formerly stopped.

My route as far as this was by prismatic compass. The remainder of it was done with a plane-table from a base at Yezd, and from a triangulation near Teheran kindly lent me by Colonel Wells, R.E. The actual road was taken by compass and plotted on to the plane-table sheets, and frequent observations for latitude were taken with a small theodolite.

The heights were computed from the mean of three aneroid barometers, checked occasionally by the boiling-points of eight different thermometers whose mean was taken. The heights taken in 1888 were with one small aneroid only, consequently the former are the most trustworthy, though still only approximate, and, although the readings tally fairly well throughout, there are several considerable discrepancies, as, for instance, at Tut, which in 1888 I made 3140, in 1890 became 4585 feet; and although on the last occasion I was camped a good deal higher up beyond the village, in a garden, it does not account for the difference. At Anarak, again, not more than five or six days' journey further north, the readings at both periods corresponded closely.

As regards the number of the Parsis in Yezd, in 1889 they numbered 6737. Of these the greater number live in the surrounding villages, chiefly on the road to and in Taft, where they have 250 houses; and the villages of Zainabad (30 houses), Cham (50 houses), and Mubarakah (50 houses) are passed, as well as several other larger ones lying within 3 or 4 miles of the city. In all the above mentioned the population is entirely Parsi. They have several fire-temples in the city, but they simply consist of rooms in private houses and as unobtrusive as possible, so as not to attract the attention of the Mohammedans. There are several towers of silence about, one of which lies on the eastern

extremity of a chain of hills passed on the road to Taft, and there is another one out in the desert to the north of Kalanta.

The Parsis have several places of pilgrimage near Yezd, to which they resort at certain seasons. One which I visited, called Narakie, is on the south-west side of the Palangun hills, where there is a waterfall, and another one, called Chak-Chak, is at the foot of a lofty mountain of that name, and lies some miles to the right of the road between Yezd and Tut; there are springs in the place. When I arrived in the city, there were no Europeans living there except an Austrian dentist and his wife, who were just leaving after a few weeks' stay. On my return to the city in May, 1891, I found a couple of European merchants from Isfahan had opened branches there. The natives of Yezd never use ploughs, but dig up their fields, which must be a tedious process; indeed, I cannot recall the sight of a plough in the whole of Persia.

I employed a Parsi as servant during my stay in the city and its neighbourhood, and he proved firstrate as a cook and attendant, and very useful in a variety of ways with his race, amongst whom I was living. A fair number of them have been to Bombay and Karachi as merchants or servants, and often, when passing through their villages, people would come out and address me in Hindustani. They drink, but do not smoke, and produce excellent wine. Their aptitude for trade, of course, is well known, and I think that their success is a great deal owing to their marked preciseness and energy, in which qualities the Oriental is so often deficient. They are all obliged to wear dust-coloured clothes, and are not allowed to ride horses in the city. Their official head, however, had a special permit from Teheran permitting him to do both. The persecution they suffered in former times is a matter of history, but in recent years their condition has been immensely improved.

Yezd is a centre of the opium trade, and about 4000 chests are exported annually *viâ* Bandar Abbas, from which port they are shipped to Bombay.

I arrived at Yezd on June 12, 1890. The weather had been getting warmer, and the thermometer, which stood at about 80° Fahr. at noon in April when at Lingah, on the coast of the Persian Gulf, was now at 93°, and travelling in the day was no longer comfortable. On the 27th it rose to 102°. I consequently decided to pass the hot weather in the hilly tract to the west of the city known as Kohistan. I accordingly left the town on the night of the 29th, and reached Taft early the next morning, the Kalantar of the Parsis, their official head with the Persian government, accompanying me. My caravan consisted of one Hindustani Mohammedan (a Shiah), one Persian servant, a riding-horse, four mules, and two light tents of 60 and 40 lbs. respectively.

Taft is a town of about 1000 houses, and contains a mixed population, Mohammedans and Parsis, who live together in a friendly way. Its elevation is about 5400 feet, and the temperature was about 20°

lower than that of Yezd. As Taft has been visited by many previous travellers, I will not say more about it. From Taft I went on to the beautiful valley of Deh Bala in the midst of the hills. It is covered with villages and gardens, and shaded by trees, under which run streams of the clearest and the purest water. The elevation of the valley is about 8000 feet, and the temperature midday about 70°. Most of the well-to-do inhabitants of Yezd have gardens either here or in the adjacent villages, with summer houses to which they and their families resort during the hot season, precisely as we do in India to the hill stations. The cold in winter is excessive in these elevated regions, and the snowfall is so heavy that for days and days together the inhabitants are unable to leave their villages. The permanent portion of the inhabitants are fruit-growers and cultivators, and during the summer months may be met in large numbers bringing in their produce to the city at night on mules and donkeys in panniers. Amongst the products of Kohistan are mulberries, white and black, apples, cherries, melons, plums, figs, walnuts, filbert nuts, apricots, peaches, quince, and grapes, potatoes, cabbages, spinach, lettuce, cucumbers, beetroot, radishes, onions. Besides fruit-trees there are numerous other species, including the willow and poplar. On the hills themselves are a variety of shrubs, amongst which is the asafœtida plant, gathering the juice from which provides a lucrative employment to the inhabitants during the autumn months.

After a few days in the valley, I started to ascend Shir-Kuh, so called from its supposed resemblance in profile to a couchant lion. The ascent to a height of 11,400 feet occupied myself and the baggage the greater part of the first day, and comprised the steepest part of the ascent. We camped on an open slope sheltered by undulations, where there was water and an abundance of firewood in the shape of bushes about 3 feet high, which were easily uprooted. Next morning I rode up a gradual incline, passing a large snowdrift in a hollow facing north, and reached the summit, whose elevation I found to be 13,740 feet by boiling-point thermometers; the average of ten thermometers was taken. The temperature was 57° at midday, and though elsewhere the sky was cloudless, we experienced several slight showers from clouds hovering overhead. The view was magnificent. To the south-east and north-west stretched a great chain of peaks dividing Kohistan into two portions, that to the east being Pesh-Kuh, and to the west Pusht-Kuh, the intervening space, comprising the richest valleys and highest peaks, being known as Mian-Kuh. To the south a mountain whose last thousand feet or so were perpendicular walls of rock was the Kuh-i-Tezarjun, and further to the south-east lay the Kuh-Arderushk; the heights of these two peaks, by angles taken by theodolite and plane-table, were about 14,000 and 14,500 feet respectively. To the north-east, upon a brown plain covered by haze, lay Yezd, with the domes and minarets of the Juma Masjid sparkling in

the sun; to the west lay other chains of hills. I was amused by my Hindustani servant Jafar, on my telling him to get tea ready, saying that there was no water, although there was a large snowdrift close by. The south side of the Shir-Kuh was almost perpendicular; one could have pitched a stone with ease from its summit into Deh-Bala lying 6000 feet below. The perpetual snow-limit in these parts would be a good deal higher than 14,000 feet, for the snow only lay where it was very much sheltered from the sun, and though it thawed during the day, it froze again at night. On the return journey we saw several large horned sheep, said to be *moufflon*, and saw a herd of ibex.

Returning to Deh-Bala, I visited the villages of Masha, of about 500 houses, with several other large ones close by. To do so we passed under the Kuh-Tezarjun, from which the ice-supply for Yezd is obtained. Masha is said to contain a large number of the Babi sect, but as they are still liable to persecution if reputed to be Babs, it is difficult to gain any reliable information on this subject. The next point of interest visited was Kal-Bal-Biseeze, a spot where a stream of water rushes out from under the mountains south-west of Mehriz, and waters the whole of the adjacent country. There is a pool about 200 yards in length full of fish, but they would not rise to a fly. At Darab I saw fish rise of 6 or 8 lbs., but could not hook one, though I got lots of half-pounders on a fine trout cast with two small black and a white moth flies. In some parts of Persia excellent fly-fishing is obtainable, and it is always advisable to carry a single-handed rod and fly-hook. There are a great number of quail and red-legged partridges in the Arderushk mountain, and also sand-grouse, rock-pigeons, and hares; also antelope near Mehriz. I have often seen from fifty to a hundred quail rise *en masse* from streams in the hills where they were drinking. There was a very tall and old tree in the village of Mehriz, which I measured by the common expedient of measuring the shadow of my walking-stick and then taking the length of the shadow of the tree. The inhabitants laughed at this, and, to prove my error, sent a boy up to the top of the tree, to let a string with a stone at the end of it down to the ground. The string was then stretched upon the turf and compared with the mark I had made showing the tree's height, and to their great astonishment they were found to correspond. After some reflection it dawned on some of the more thoughtful of them how it was effected, and they were immensely delighted with the idea. I know nothing of geology, but the hills near Yezd reminded me of the trap formations I have seen in India, and the circular formations of many of the hills, with a deep depression inside, suggested craters at some bygone period. There are some caves near Taft, partly natural and partly artificial, in which there are traces of copper ore, and antimony is occasionally found in fragments on the hills, but I believe that there are no mines working.

The weather being much cooler, I returned to Yezd in September,

and on the 25th of that month started for Jandak. After four marches in a northerly direction through mountainous country, I arrived at Tut, a village which I have described in a previous paper. Two more marches brought me to Zarin, a small hamlet at an elevation of about 3700 feet, and where I saw the first date palms since leaving Niriz, an indication that I was not far from the salt desert of Persia. The next 36 miles of the road were waterless; so, filling the water-bags, we started about four in the afternoon, and at ten at night bivouacked amid a waste of sandhills. Starting again at about 4.30 in the morning, we pushed on and reached the village of Hajiabad, a small oasis in the desert, and shaded by date palms. With the next forward march we reached the foot of the Kuh-Surukh, a reddish mountain overlooking Beyaza, and north of the Kuh-Parviz marked on existing maps. There was a spring here, which leaving at dawn we crossed the Gudar-i-Surukh (Red pass), 4860 feet above sea-level, and, descending, reached Beyaza, at an elevation of about 3300 feet. This place contains a shrine much resorted to by pilgrims. The governor of the district, who was on tour, came to visit me, and we became friends at once, and I promised to spend part of the winter with him at Khur, where the climate is unusually mild for these latitudes. Near Beyaza was the village of Ab-i-Garm, where a spring of water at a temperature of 125° issues from the ground, and within ten yards is another stream whose temperature is below 60°. It is much resorted to, as the waters are said to possess healing properties, and there is a small bathing-house over the hot stream. The natives say an Iman was killed here in a battle, and that where he fell the streams burst from the ground, which was previously dry, and have been flowing ever since. There is a good deal of lead ore in the hills between this and Beyaza, which is said to yield 30 per cent. of the pure metal, and also considerable quantities of alum. There are also ancient copper works close by.

The next place of interest I arrived at was Jandak, about four marches further on. Jandak contains about 1000 inhabitants, and is situated on a great slope which descends towards the salt desert. To the south of it is a great range of mountains with several lofty peaks, while to the north the salt desert stretches away like a sea before one, the mountains on the further side to the north being just visible. There is an old fort, with a massive wooden door which the inhabitants asserted was made from the wreck of a ship which floated on the prehistoric Dariya-i-Saveh that is asserted by tradition to have covered the salt desert. I saw several caravans of camels resting for the day previous to making the journey across the salt desert to Damaghan, which is waterless for nearly 100 miles. I made the latitude of Jandak 34° 3′ 41·5″, and the elevation about 3400 feet. From Jandak I decided to make straight across country by the nearest practicable route to Kashan, to ascertain the southern limit of the salt desert.

Leaving Jandak, I marched for three days in a southerly direction, making a *détour* round the immense sandhills which fringe the southern portion of the desert in many places. Distant on our right lay the Rig-i-Jin Sands of the Genii, which reach far into the desert, extending, it is said, right to the other side. Natives are very much afraid of them, and will not sleep there on any account, as they are said to be haunted. The inhabitants of Jandak asserted that formerly these sandhills were inhabited by wild camels, which were of a whitish colour and very swift; also that they used to go out and shoot them, but that about seven or eight years ago there was an unusual dearth of grass, which is supposed to have killed them, as none have been seen since. These animals are said to have been the product of stray beasts which wandered there originally. The sandhills are now said to have been broken through by the floods of salt water which are poured into the desert from the rivers and streams during the winter months.

On the third day after leaving Jandak I entered the Rig-i-Chichagun, an immense waste of soft sandhills, in some places nearly 300 feet in height, and reached a well in a hollow, where we camped for the night. We were now nearly on the level of the salt desert, the elevation being 2800 feet. For the greater part of the next two days we marched through the sandhills, which were covered with a dense growth of tamarisk bushes, averaging about 8 feet in height, though they sometimes rose to 14 feet, the sand being a little firmer immediately where they grew. We travelled through the bushes for about 9 miles, and as we progressed the whistling sound from thousands of jerboas, which scampered away into their holes on our approach, was incessant. They burrow under the roots of the tamarisk. The animals, or jerboas—for such I took them to be—were of a silvery-grey, with a chestnut tuft at the end of their long tails. Their fore legs were much shorter than their hinder ones, and as they sat erect—a favourite posture with them—had a strong resemblance to a miniature kangaroo. I shot one, so as to examine it more closely; but my servants, who concluded that anything shot was going to be eaten, remonstrated strongly, saying it was quite unfit for food. The tracks of hyenas were dotted over the ground in every direction. As I went on ahead of the caravan with the guide, we lit occasional fires to show the direction.

Leaving the tamarisk, which stretched away on our right, we arrived at a spring at the foot of a chain of hills called Nukluk. Close by were the ruins of a town built of stone, containing three or four hundred houses and a stone fort—remarkable features for this part of Persia, where all buildings are invariably constructed of sun-dried bricks. A mile further on were the remains of another town and fort built of stone. There were also the ruins of large embankments built across ravines in the hills, showing how the inhabitants obtained water. The fort was about 80 yards square and very massive,

and of a curious construction, as the towers had a peculiar bulge outwards in the middle of them. The walls were from 3 to 5 feet thick. The only ornamentation was that of the niches in the walls, consisting of four or five parallel lines surrounding them. A small building or dome on four arches stood near the entrance to the fort, and there was another one halfway up a hill close by. There were about 1000 houses in this further town. In many places lay heaps of stones from which the copper had been extracted by smelting. We had also passed numerous similar heaps in the tamarisk, and my guide said that he had heard that the town had formerly been occupied by Zoroastrians, who brought their ore here to smelt on account of the large supply of firewood. The ground inclined slightly upwards towards the hills, and I noticed that the lines of the fort were all parallel to it.

Twenty-five miles further on we reached Baba-Khalet, where there was an old tower built for protection against the Turkomans, who used to raid thus far. Its elevation was 3200 feet. It was now near the end of October, and in the evening some wild duck, the first I had seen on this excursion, came from the north and settled on the water. There were a lot of camel-drivers in the place, who recognized me, and said, "Ah! you're the *Feringhi* we had a row with at Anarak two or three years ago," and laughed, and told my servants the history of the affair. Finding fresh provisions running short, I sent my servants to a village I saw in the distance with my large telescope to get some more supplies, and halted for the day. This hamlet is the last one to the north until one gets close to Samnan. About 4 or 5 miles off in a northerly direction the country is covered with tamarisk for miles, and from a distance looks like a forest; these bushes grow very densely in many places along the borders of the swampy part of the salt desert, which is known as the Kavir or Dasht-i-Kavir.

The next seven marches were in a westerly direction, parallel to the mountains, which I occasionally passed through. There was no road, and only at rare intervals any track at all, and we were usually in sight of the desert on our right. On the fifth day we saw desert on both sides of us, and saw where the road from Yezd to Kashan ran along the foot of a great hill-chain containing the Kuh Natenz. We continued on over undulating grassy slopes, passing shepherds with countless flocks of sheep and goats belonging to the Sarab Arabs, who graze their flocks in these parts, and are said to be great robbers; but they were very friendly, for I told them I knew their chief, who was formerly Governor of Yezd, under the title of Seham-i-Sultan. In fact, I employed two of them, who I found invaluable as guides. On the eighth day from Baba-Khalet we reached a small village, and the next march, down a long and gentle descent for more than 20 miles, brought us on to the high-road, along which we travelled into Kashan.

Early in December I was joined at Isfahan by an old friend, Captain E. B. Burton, of the 17th Bengal Cavalry, who had previously arranged to meet me, and we started together for the Khur district. We went along the high-road as far as Nain, and then struck across a waterless desert to Anarak. The first day we did about half the distance, and halted for the night in a small stone building about 30 feet by 15. As it was intensely cold we all crowded into this, three Europeans—for Monsieur Staal had joined us at Nain—all our servants, four horses, the cooks and muleteers; there was hardly standing-room. However, we lit a large fire on a platform in the middle of the apartment, and settled down for the night. We started next morning at two, and reached Anarak before it got dark. Arrived there, we put up in the Caravanserai. The next day there was about a foot of snow on the ground, so we halted. As I have already described this town in a former paper, which was kindly read for me by Sir F. Goldsmid, it is unnecessary to say anything further about it.*

After halting for one day we left Monsieur Staal, who was prospecting for minerals, and resumed the march. After two days we reached Musajari, where there were some old stone ruins said to have been built by the Zoroastrians, who had a settlement in these parts, and also some *haoz*, or tanks for storing water, but mostly in ruins. The next place of interest reached after passing Abbasabad was Haft-Toman, whose elevation was 3500 feet, and the thermometer stood at 16° at night, the coldest reading we got in Persia. There was heavy snow all over the ground, which was not frozen, and as we neared the village we suddenly floundered into the cultivation, where our horses sank deeply. The villagers said they had no room anywhere for us, so my groom, dismounting, ran up to the headman, seized him by the collar, and, raising his whip, looked at us and said, "Shall I flog him?" We finally managed to get shelter in some empty huts without this event coming off, a few hundred yards from the village, and soon had a good fire burning, but sat on the floor to avoid the smoke, for which there was no outlet except the door. A couple of wolves were seen prowling round during the night, but we were both too tired to wait for a shot at them. So, after putting all the horses and baggage animals inside a building, we turned in for the night. In the morning we resumed our route to Garmab, descending gently all the way. At about half the distance we crossed the snow-line, and finally reached the town, which stood on an open slope surrounded by large plantations of date trees.

The warmth of this place was remarkable, the temperature ranging from 32° at midnight to 42° at noon. It was sheltered under a range of hills, and the water which issued from a cave blasted in the rock

* See R.G.S. *Supplementary Papers*, vol. iii., and *Proc. R.G.S.*, vol. 12 (1890), p. 577.

was quite warm. There were about 500 inhabitants in the town, who came out to meet us, and a sheep was killed in the roadway as we entered. The headman said that all this was an *istikbal*, or reception in our honour. Garmab was only 700 feet below Haft-Toman, yet frost was very rare there, the inhabitants saying that it only occurred sometimes on cloudless nights, and that if there is a frost for more than nine or ten nights the date trees get blighted, and the crop, their chief means of sustenance, fails.

Our next march was on to Khur, and we had to cross a range of hills *en route*. On the hills a snowstorm overtook us, which obliterated the tracks rapidly, so we rode on at a fast trot. All of a sudden, while descending, we emerged out of the snowstorm and crossed a sharply defined line, beyond which there was no snow, and saw the town of Khur in front of us. After waiting in the town surrounded by a crowd, the governor arrived, returning from Farukhi, and we met with a friendly reception; a house was given us to live in, and stabling was provided. I had met the governor, Mirza-Mahdi-Honar, at Beyaza several months previously, and he and his uncle Mirza-Ibrahim, known as the "Yaghma," or robber, were both most polished and courtly gentlemen. It appeared that the latter was known by this name on account of his having been the victim of some injustice which ended in his being robbed.

While here we were told one evening by the governor, as he came in to take tea with us, that he had just had a row on our account. One of the *Moolahs* had denounced him for showing hospitality to *Kafirs* (infidels), and had collected a crowd with sticks and stones who marched towards the governor's house, intending to drive him out of the town as they had done his predecessor. Luckily, the Naib's brother was a captain of infantry, and he at once collected fifty or sixty of his men together and marched against the rioters, who, on seeing his force approaching, turned and fled. This was the first we heard of the proceedings. We stayed at Khur for two weeks, during which there was a good deal of rain, the temperature ranging between 44° at night and 58° at noon. There are some large date-tree plantations in the place, and all the crops are grown beneath their shade, as is also, I understand, the custom in the Sahara desert. The soil was everywhere impregnated with salt, and the water was slightly saline. The place stands at an elevation of 2600 feet, and is built on a *khur* or inlet which joins the salt desert, whose level is nearly the same in these parts. From here we made an excursion due north over a range of hills and down to within a few miles of the *kavir*. North, east, and west was one bare brown expanse as level as the ocean. If dry it would probably have shown up white, on account of the surface salt drying; here and there on its surface could be seen channels and streams of water twisting about, but not an atom of vegetation. The mountains

near Samnan, Turut, and Tabbas were plainly visible, while to our right a solitary rock stood out from the otherwise uniform level, known as Chashma Airacoon. Captain Burton, who was more to the east than I was, thought that the drainage of the *kavir* in this part—that is, to the east of a line drawn due north through Khur—runs south, and our observations for altitudes seem to bear this out.

Returning to Khur, we left that town on January 9, 1891, armed with letters of introduction from the Governor of Khur to all villages *en route*, and also to the Khan of Tabbas. On the first day we reached Chastab, and followed a route nearly the same as that travelled by the late Sir Charles Macgregor up to Tabbas. On the fourth day we crossed a neck of the salt desert, but could not ascertain how far it extended south, as sandhills in that direction shut out the view, but there were no signs of any large volume of water finding its way in that direction. At night we camped on a sandhill in the middle of it. The elevation of the salt desert here was 2130 feet, the lowest reading we got upon it. In the morning we found that all the mules had stampeded in the night, and Captain Burton's horse was lame. We had drunk up most of our water, so the only thing to do was to load up two camels, which were carrying water, forage, *and* firewood, with a tent and some supplies, and make our way on to Chah-Mehji as best we could. We made 18 miles this day, Burton on foot and myself riding. The ground was swampy in places and very uneven, resembling a muddy road full of deep ruts and footprints suddenly stiffened.

We marched on, reaching soft sand, and after it was dark the guide lost the track, so we lay down for the night where we were, with a waterproof sheet over our blankets. We woke in the morning to find it snowing hard, so loading up we hastily resumed the march. In an hour's time we came across the track, and, following it up, reached Chah-Mehji. There were one or two wells, and a couple of shepherds with large flocks of sheep and goats. Here we waited for four days, hoping our baggage would come on, our camel-man being sent back with water for our servants and horses the same afternoon. On January 15 and 16 it rained and hailed heavily, and we collected the hail from our tent and waterproof sheets to get fresh water, as the wells were brackish. The tent was very warm, as we had had 18 inches of felt sewn all round its lower edge; this was turned in, and a carpet and boxes placed over it, while a small iron pan filled with red-hot embers from a fire outside kept up the temperature. The tent, a double fly, with iron pegs and felt included, weighed only 50 lbs. On the third day our servants and the baggage came in. They had been found by a passing caravan, who dropped their own loads there and brought ours on; for this, of course, we paid regular salvage rates.

Next morning we loaded up, and they took us to Dorin, the nearest village, and on the direct route. In the evening our mules arrived; the

charvadar said that he had found them at Khur, nearly 80 miles further back. They were much cut about, the saddles having got under their stomachs. This hamlet was up in the snow at an elevation of 3000 feet. There were a few dwarf palms, and an oily film on the spring which bubbled occasionally. Immediately beyond the village was a great range of hills running north and south, and forming the eastern boundary of the salt desert. Resuming the march, which lay over these hills by a pass 700 feet above the village, we descended, and, passing through two hamlets, arrived at Char-Deh, which contained a fine large caravanserai recently built. The elevation was only 2000 feet. An immense salt plain extends southward from here in the direction of Tabbas, and to the south as far as one can see. This is said to be impassable in many places, and from its whiteness in parts is no doubt similar to the salt desert north of Khur and Jandak. If connected with them at all, which is open to doubt, it can only be by the neck of *kavir* which we crossed just before reaching Chah-Mehji, which is only from 15 to 18 miles broad at the utmost. Also the indications as to the flow of the water were so vague when we crossed, that both Captain Burton and myself concluded that at our crossing-point the drainage, if anything, was north. If so, the Tabbas desert is a separate one altogether, and considerably lower than the Dasht-i-Kavir; and as Char-Deh was well above it, and at least 2 miles off, its elevation cannot have been more than 1800 feet, and opposite Tabbas, whose elevation was 2100 feet and several miles from it upon a slope, considerably lower. The desert we now saw is probably part of the one which lies to the east of Yezd, behind a lofty chain of hills, and on which salt lakes or swamps are said to exist.

We sent on a servant to Tabbas with a letter of introduction from the Zil-i-Sultan, a royal prince and Governor of Isfahan. We were met outside the town by the Khan's nazir, and further on by mounted servants, who were useful in keeping off the inhabitants, who crowded round us as we passed through the city. A house was assigned us to live in, and servants were appointed to look after our wants; everything in the way of hospitality was done lavishly, in a truly Oriental style. The Khan sent us food every day, and insisted on feeding not only ourselves and servants, but also our hired muleteers and mules, while the nazir was always about inquiring what we wanted. Although it was the 21st of January, the orange trees in our garden were covered with fruit, and during our stay there of three weeks the thermometer never fell below 30° at night, or rose above 52° in the day. Once or twice a little snow fell, and we got some fair duck-shooting in the neighbourhood of the city. The Governor of Tabbas is the Imadah-ul-Mulk, and the post has been hereditary in his family for the last three hundred years. He is about seventy years of age, and suffers greatly from rheumatism; he was a most affable and courtly old gentleman. We often visited him, and I made him an enlarged portrait in water-colours, taken from a

photograph, with which he seemed greatly pleased. His house, or rather palace, was a fine one, with splendid gardens attached. The city numbers about 7000 inhabitants, and contains mosques, baths, and a college. Opium and tobacco are largely grown, and the number of trees, of sweet and bitter oranges, besides date palms, was considerable. One evening we sent the nazir a bottle of brandy to drink, and next morning asked him what he thought of it. He replied, "It is not very strong. I and a friend finished the bottle between us, and felt much the same as when we started drinking it, so we had to finish up with *arrack*"—a native spirit made from dates, and very heady.

Taking leave of our friends, amongst whom were one of the khan's sons, a Persian colonel, his vizier, and the nazir, we left the place, marching north. At Char-Deh we separated, Captain Burton going on to Dasgirdun, while I went round by a more circuitous route along the edge of the Dasht-i-Kavir. To do this I retraced my route for 17 miles, and then went north over some high ground through a pass into the *kavir* basin. *En route* we passed over a plateau about 4000 feet high, and saw many dying sheep and hundreds of their carcases, on which vultures were feeding. This was the result of a heavy snowfall, which came on so suddenly that they were unable to reach shelter, and so heavily that they could not get at the grass.

Leaving the hills, we descended to Halwun, at an elevation of 2600 feet, and near the *kavir*. The village contains about a hundred houses, and the sandhills which lie to the west of it are constantly encroaching and can only be kept out by high walls. The sandhills, which are low, extend for about 3½ miles in breadth, and terminate in *kavir*. To the south they extend beyond Chah Mehji for many miles. This place is said to be the site of the ancient city of Halwun, and the sandhills and hard clayey ground between them are strewed with broken pottery, tiles, and bricks for several miles, while in places the lines of the walls, towers, and houses are visible. It is said to have been a Zoroastrian city, and to have been overwhelmed by the sand, there is also a tradition that it was once a seaport. Numerous lines of ancient *kanats* could still be traced from the hills. The fragments of pottery I gathered and showed to an expert in such matters at Teheran were said to be *Cuphic*, and a gold coin reported to have been picked up there was examined by my Persian groom, a highly educated man, who said it had an inscription in the same language.

It seems to me unlikely that anybody would found a city amid a heap of sandhills. If so, it appears to indicate that the sandhills are comparatively recent accumulations of dry blown sand from the surface of the desert. The whole of the northern border of this desert is absolutely free from sandhills; so is the western one except near Chah-Shur and the Kuh-Tulha, while on the west and south-western and partly on the south border are immense accumulations. The eastern

slopes of the sandhills are, where they rest against no support, steep, while their western slopes are much gentler. My opinion is, therefore, that these hills have been formed by the west and north-western, which are the prevailing winds, and that their shape has been modified by the sheets and streams of water which come down from the hills after heavy rain, and give them the appearance of sandbanks which have been thrown up by rivers that have long since disappeared. In windy weather one sees the tops of the sandhills smoking, as it were, a dense cloud of sand being thrown off. The hills at Chah-Mesh-mus too are all said to be shifting west, and the bushes growing there all indicate a prevailing wind in that direction. The sand of all these hills is the same, a fine grey sand containing occasional small garnets. Innumerable beetles, the scarabeus, and lizards, scorpions, etc., live amongst them, while the tamarisk and in some places tufts of bunch grass grow. Besides these sandhills, I have seen others at Kashan and between Isfahan and Abadeh which contained extensive ruins.

The next march was to a village, Pir-Hajat, which is situated at a height of 3650 feet, at the foot of the Halwun range and overlooking the great desert. It is a fort containing but few inhabitants, and is perched on the summit of a rock, and resembles a mediæval castle. It is very ancient, and was formerly a Zoroastrian town named Irawar, which, after being conquered by the Arab Shaikh Pir-Hajat, took his name. It is situated on the banks of a broad watercourse, along which a torrent 40 feet broad poured violently down a great slope towards the *kavir*, on whose vast expanse a small white sheet marked its termination many miles away.

Leaving this village we soon entered the hills, and while crossing over one of them saw a vast sheet of water glistening in the sun, and about where the Kal-Mura river might be expected to terminate. I watched it for a long time through my glasses, and came to the conclusion it was water, as its banks were so distinct, and it had the true liquid colour and sparkle; but it may have been only a mirage, as will be seen later on. During this march I came across a lot of wild sheep; had a stalk and a shot, but did not bag one. We halted for the night at a hovel called Mazra-Dahna-i-Mimbar, round which there were lots of partridges, hares, and ibex. The next march, a long one over open ground, brought me to Dasgirdun, where I found Captain Burton, who had arrived before me.

This place was a collection of villages in the Tabbas district, and situated in a regular quagmire at a height of 2850 feet, on what looked uncommonly like *kavir*. If one went but a few feet from the beaten tracks, a horse would sink nearly up to his girths. The inevitable desert was well in sight; in fact, it was difficult to say whether we were actually in it or not. At this point we hired ten camels to carry our provisions, water, forage, and fuel, as we should get no further

supplies until we reached Turut, which would take eight or ten days provided all went well, and no swollen rivers or other obstacles were encountered. A servant of the Khan of Tabas, who had accompanied us thus far to facilitate our progress, now left with a gift of a Waterbury watch, at which he was greatly pleased.

On the second day, and at a distance of 18 miles from our starting-point, we crossed a ravine about 200 yards broad, with small cliffs for banks; this I learnt was the Kal-Lada river, which flows into the *kavir*, but was now dry. It rises about the foot of the Kuh-Yak-Ab, a lofty peak some miles to the east, under which I had halted in 1888. Then on to the foot of the Kuh-Safeid (white hill), where we halted for the night. The next march, over several miles of slopes covered with swarms of sand-grouse, brought us to the Kal-Dasgun river, which I once mistook for the Kal-Lada, by which latter name it is erroneously called in a former paper read on my journey in 1888. A little further on we reached ground I had previously travelled over near Chashma-Dubor, from which point the whole of the journey to Turut was over ground already described.

The only difference was in the time of year. On my previous journey, which took place in August, the heat was intense, and locusts, horse-flies, large tarantulas, and snakes abounded; whereas now it was the month of February, and the only things to trouble us were leeches, which abounded in many of the springs. The day before we crossed the Kal-Mura river, I had a large telescope upon a hilltop, and in the evening saw on the salt desert what appeared to be a large lake many miles square, and could see the waves caused by the wind. Captain Burton also saw it. Next morning there was not a vestige of it visible, and I can only suppose that it was a mirage. We both saw the same kind of sights frequently; for instance, when descending from Chastab we distinctly saw a sheet of water on the desert, and the Halwun hills lying beyond reflected in it. But next day, on viewing the same spot from other points, there was not a sign of any water on the desert at all. It is therefore possible that what I saw from the hills near Pir-Hajat, and took to be water, was nothing but mirage. The atmospheric effects in these regions are peculiar; distant hills often appear as points in the air, while the sky runs along underneath them, and as one approaches nearer the sky under them fades away, and the bases of the hills join the ground. Midday waves of heat are given off by the soil to such an extent that objects look double their size, and distorted out of all proportion. When overtaking our camels, which always started about six hours before us, we often amused ourselves by speculations as to what the curious objects looming ahead were, whether they were men or camels, or men mounted on camels.

(*To be continued.*)

THE ORIGIN OF THE KAFIR OF THE HINDU KUSH.

By Colonel T. H. HOLDICH, R.E., C.B., C.I.E.

SPECULATIONS as to the origin of the Kafir have been free and frequent of late years. It has long been known that the Kafirs themselves claim a Greek origin, or at least that some, amongst the many tribes represented by the name of Kafir, claim this distinction. The most natural as well as the most recent hypothesis is, that they are the modern representatives of a very mixed race, chiefly of Tajak origin, who once occupied the lowlands of Badukshan, and that they have gradually been driven into the almost impenetrable fastnesses of the lofty mountains which they now occupy by successive generations of land-grabbers, who at present hedge them in under the names of Safi, Nimcha, Dehgan, etc. These people may have originally been Kafirs themselves, although, through contact with the outer world, they have lost the prominent physical attributes of the Kafir; but they now range themselves amongst the most fanatical of Mahomedan sects, and between them and the Kafirs of those hidden valleys which lie south of the Hindu Kush watershed, between the Panjshir and the Kunar rivers, there is nothing short of eternal blood-feud. Quite lately the Afghan has appeared on the Kafir borderland, and the process of proselytizing at the point of the bayonet has been commenced, which can but end in the extinction of the infidel forms of faith. There are villages to be seen in the Kunar basin where yet you may find the quaint dead-boxes of the Kafir—the wooden receptacles into which their dead are laid without the form of burial—side by side with the Mahomedan grave, with its neat and orderly mound of earth decorated with stones, and with a wooden effigy at head and foot. The religious observances of the Kafir are so mixed, and show such an impartial leaning to Zoroastrianism, Brahmanism, and pure heathen superstition, that it might appear that they are either the possessors of an original form of religion, from which has been evolved the first principles of other modern forms, or that their own form is but an imperfect adaptation of Gabr and Brahmanic beliefs to an ancient mythology.

Apparently they have no written language the characters of which might give us a clue to their origin, and not much is to be gained from the study of a language colloquially whose dialects vary so much between tribe and tribe, that tribal inter-communication is frequently impossible. It must be remembered, however, that Kafirstan is but very partially explored. Only the fringe of the country has been visited as yet, and we cannot presume to say what may be found in the interior. The people whom we know best are Kamdesh Kafirs from the lower Bashgol valley. The Bashgol is a large affluent of the Kunar river, joining it from the north-west some 40 miles below Chitral; the Bashgol valley in its upper reaches being separated from Chitral by the barrier of the

Hasund range, which reaches an altitude of 15,000 to 16,000 feet above sea-level opposite Chitral.

In the case of the Kamdesh Kafir, at least, the tradition of Greek or Pelasgic origin seems likely to be verified in a very remarkable way. Scientific inquiry has been converging on him from several directions, and it seems possible that the ethnographical riddle connected with his existence will be solved ere long. In appearance he is of a distinct Aryan type, with low forehead and prominent aquiline features entirely free from Tartar or Mongolian traits; his eyes, though generally dark, are frequently of a light grey colour; his complexion is fair enough to pass for southern European; his figure is always slight, but indicating marvellous activity and strength; and the modelling of his limbs would furnish study for a sculptor. In rapidity of movement over a hill country he stands unrivalled even amongst Himalayan people. His manners, customs, and dress have all been recently well described by Dr. (now Sir George) Robertson, whose adventurous spirit led him to spend some months amongst the Kafirs of lower Bashgol.

At the present moment Kafirstan extends no further eastward than the valley of the Kunar river, but there appears to have been a time in remote history when the Kafirs occupied the fertile valleys of Bajour, Swát, and Dir—valleys which for subsequent centuries formed part of a great Budhist kingdom prior to the advent of the Yusafzais upon the scene. Readers of Arrian's history of the invasion of India by Alexander will remember that much of the interest of that graphic narrative centres itself on this border of India. Though comparatively unknown and even unexplored in these days, it must be remembered that to ancient classical writers this was perhaps the best known of all the outlying districts of India. The recognized road to India from Central Asia was that which passed through the plains of Kabul, by the valley of the Kabul river into Laghmán, or Lamghán, and thence by the open Dasht-i-Gumbaz into the lower Kunar. From the Kunar valley this road, even to the time of Baber's invasion of India (early in the sixteenth century), crossed the comparatively low intervening range into Bajaor; thence to the valleys of the Panjkora and Swat, and out into India by the same passes with which we have now (after nearly four hundred years) found it convenient to enter the same districts. As it was the first great avenue of approach to India, so its geography became more especially familiar by repute, and there is, consequently, more accurate geographical reference to the valleys of the Kophenes and the Khoaspes (*i.e.* the Kabul and the Kunar) in classical authors than to any other part of the hydrography of India.

On the right bank of the Panjkora river (the ancient Ghoura), nearly opposite to its junction with the river of Swat (Suastos), is a very conspicuous mountain whose three-headed outline can be distinctly seen from the Peshawar cantonment, known as the Koh-i-Mor, or

mountain of Mor. On the southern slopes of this mountain, near the foot of it, is a large scattered village called Nuzar, or Nusar. The sides of the mountain spurs are clothed with the same forest and jungle that is common to the mountains of Kafirstan, and to the hills intervening between Kafirstan and the Koh-i-Mor. Amidst this jungle is to be found the wild vine and ivy.

Now let us turn to Arrian's history. After fierce fighting in the Kunar valley with a people who "far excelled all other Indians in military exploits," Alexander passed through the territories of the Guræi, and crossed the river of that name (now called Panjkora) with great difficulty, "not only because of the depth and rapidity of the stream, but by reason of the vast number of round and slippery stones at the bottom," and led his army against the city of Massaga, the capital of the Assakeni. This city was in the upper Swat valley, and it made a brilliant but unavailing defence. Then followed the march to Embolina, on the Indus (now known as Umb), and the episode of Aornos, one of the most stirring tales in history. After the reduction of that natural fortress (now identified beyond dispute with Mahaban), we are told that, "descending from the rock, he marched into the territories of the Assakeni" *again*, "for he had heard that the brother of Assakenus . . . had fled into the mountains there, and when he arrived at the city of Dyrta (Dir), found both that and all the country round entirely destitute of inhabitants." Thus it is clear that he retraced his steps for many marches towards the Kunar valley, hunting the brother of Assacenus. Apparently he never caught him, that chieftain having probably betaken himself to the Chitrali hills, where the roads, as we know, are bad, and where there is not much room for fighting. Alexander then turned "towards the Indus," and "entered that part of the country which lies between the two rivers, Kophenes (Kabul) and Indus, where Nysa is said to be situate." "The city," says Arrian, "was built by Dionysos, or Bacchus, when he conquered the Indians; but who this Bacchus was, or at what time or from whence he conquered the Indians, is hard to determine. Whether he was that Theban who from Thebes, or he who from Tmolus, a mountain of Lydia, undertook that famous expedition into India, . . . is very uncertain." However, as soon as Alexander arrived there, a deputation of Nysæans, headed by one Akulphist, waited on him, and after recovering from the terror that his extraordinary appearance inspired, they presented a petition. "The Nysæans entreat thee, O king, for the reverence thou bearest to Dionysos their god, to leave their city untouched, . . . for Bacchus . . . built this city for an habitation for such of his soldiers as age or accidents had rendered unfit for military service. . . . He called this city Nysa (Νυσον) after the name of his nurse; . . . the mountain also, which is so near us, he would have denominated Meros (or the thigh), alluding to his birth from that of

Jupiter; . . . and as an undoubted token that this place was founded by Bacchus, the ivy, which is to be found nowhere else throughout all India, flourishes in our territories."

Why, in the face of such a plain description of the city of Nysa, so great an authority as M. de St. Martin should identify it with Nisata, which is in the open plain near the juncture of the Kabul and Swat rivers, I cannot say. There is no mountain near Nisata, and no ivy nearer than that grown in some of the pretty gardens at Peshawar. Alexander, for reasons of his own (and Arrian seldom fails to supply him with real mean ones), was pleased with the deputation, and granted the petition, and ordered that a hundred of the chief citizens should accompany him. It was then that Akulphis showed much native shrewdness in suggesting that, if he had the good of the city at heart, he should take two hundred of the worst citizens instead of one hundred of the best—a suggestion that appealed at once to the sympathies of an administrator like Alexander, and the demand was withdrawn. Alexander is then said to have visited the mountain and sacrificed to Bacchus, his Macedonian troops meanwhile making garlands of ivy, "wherewith they crowned their heads, singing, and calling loudly upon the god, not only by the name of Dionysos, but by all his other names." A truly Bacchic orgie seems to have followed; and all this undoubtedly took place at the foot of the Koh-i-Mor, which is within sight of Peshawar, and hard by where our troops have fought their way to Chitral.

But who were the Nysæans, and what became of them? M. de St. Martin says that the name Nysa is clearly of Persian or Median origin; and we find in the 'Indika' of Arrian some further description of the Nysæans. "The Assakenoi" (who inhabited the upper Swat valley east of Nysa), says Arrian, "are not men of great statue like the Indians, . . . not so brave, nor yet so swarthy as most Indians. They were in old times subject to the Assyrians; then, after a period of Median rule, submitted to the Persians. . . . The Nysaioi, however, *are not an Indian race*, but descendants of those who came to India with Dionysos," etc. He adds that the mountain "on the lower slopes of which Nysa is built" is designated Meros, and he clearly distinguishes between Nysaioi and Assakenoi.

Ptolemy barely mentions Nysa, but we learn a good deal about the supposed origin of the Nysæans from fragments of the 'Indika' of Megasthenes, which have been collected by Dr. Schwanbeck, and translated by McCrindle. We learn that Dionysos was a most beneficent conqueror. He taught the Indians how to make wine and to cultivate their fields; he introduced the first "sanatarium" by retreating to Meros in the hot weather, where "the army, recruited by the cool breezes and the waters which flowed fresh from the fountains, recovered from sickness. . . . Having achieved altogether many great and noble works, he was regarded as a deity, and obtained immortal honors," etc.

Again we read, in a fragment quoted by Strabo, that the reason of calling the mountain above Nysa by the name of Meron was that "ivy grows there, and also the vine, although its fruit does not come to perfection, as the clusters, on account of the heaviness of the rains, fall off the trees before ripening. They" (the Greeks) "further call the Oxydrakai descendants of Dionysos, because the vine grew in their country, and their processions were conducted with great pomp, and their kings, on going forth to war, and on other occasions, marched in Bacchic fashion with drums beating," etc.

Again, we find, in a fragment quoted by Polyænus, that Dionysos, "in his expedition against the Indians, in order that the cities might receive him willingly, disguised the arms with which he had equipped his troops, and made them wear soft raiment and fawn-skins. The spears were wrapped round with ivy, and the thyrsus had a sharp point. He gave the signal for battle by cymbals and drums instead of the trumpet; and, by regaling the enemy with wine, diverted their thoughts from war to dancing. These and all other Bacchic orgies were employed in the system of warfare by which he subjugated the Indians and the rest of Asia."

All these lively legends point to a very early subjugation of India by a Western race (who may have been of Greek origin) before the invasions of Assyrian, Mede, or Persian. It could not well have been later than the sixth century B.C., and might have been earlier by many centuries. The Nysæans, whose city Alexander spared, were the descendants of those conquerors, who, coming from the West, were probably deterred by the heat of the plains of India from carrying their conquests south of the Punjab. They settled on the cool and well-watered slopes of those mountains which crown the uplands of Swat and Bajaur, where they cultivated the vine for generations, and after the course of centuries, through which they preserved the tradition of their Western origin, they welcomed the Macedonian conqueror as a man of their own faith and nation. It seems possible that they may have extended their habitat as far eastward as the upper Swat valley and the mountain region of the Indus, and at one time may have occupied the site of the ancient capital of the Assakenoi, Massaga, which there is reason to suppose stood in about the position now occupied by the town of Manglaor; but they were clearly no longer there in the days of Alexander, and must be distinguished as a separate race altogether from the Assakenoi. As the centuries rolled on, this district of Swat, together with the valley of Dir, became a great head-quarters of Budhism. It is from this part of the trans-frontier that some of the most remarkable of those sculptures have been taken which exhibit so strong a Greek and Roman influence in their design. They are the undoubted relics of stupas, dagobas, and monasteries belonging to a period of a Budhist occupation of the country, which was established

after Alexander's time. Budhism did not become a state religion till the reign of Asoka, grandson of that Sandrakottos (Chandragupta) to whom Megasthenes was sent as ambassador; and it is improbable that any of these buildings existed in the time of the Greek invasion, or we should certainly have heard of them.

But along with these Budhist relics there have been lately unearthed certain strange inscriptions, which have been submitted by their discoverer, Major Deane, to a congress of orientalists, who can only pronounce them to be in an unknown tongue. They have been found in the Indus valley east of Swat, most of them being engraved on stone slabs, which have been built into towers, now in ruins. The towers are comparatively modern, but it by no means follows that these inscriptions are so. It is the common practice of Pathan builders to preserve any engraved or sculptured relic that they may find, by utilizing them as ornamental features in their buildings. It has probably been a custom from time immemorial. Only lately I observed evidences of this propensity in the graveyard at Chagan Sarai, in the Kunar valley, where many elaborately carved Budhist fragments were let into the sides of their roughly built "chabutras," or sepulchres, with the obvious purpose of gaining effect thereby. No one would say where those Budhist fragments came from. The Kunar valley appears at first sight to be absolutely free from Budhist remains, although it would naturally be selected as a most likely field for research. These undeciphered inscriptions may possibly be found to be vastly more ancient than the towers they adorned. It is, at any rate, a notable fact about them that some of them "recall a Greek alphabet of archaic type." So great an authority as M. Senart inclines to the opinion that their authors must be referred to the Skythic or Mongolian invaders of India; but he refers at the same time to a sculptured and inscribed monument in the Louvre, of unknown origin, the characters on which resemble those of the new script. "The subject of this sculpture seems to be a Bacchic procession." What if it really is a Bacchic procession, and the characters thereon inscribed prove to be an archaic form of Greek—the forgotten forms of the Nysæan alphabet?

Whilst surveying lately in the Kunar valley along the Kafiristan borderland, I made the acquaintance of two Kafirs of Kamdesh, who stayed some little time in the Afghan camp, in which my own tent was pitched, and who were objects of much interest to the members of the boundary commission there assembled. They submitted gracefully enough to much cross-examination, and amongst other things they sang a war-hymn to their god Gish, and executed a religious dance. Gish is not supreme in their mythology, but he is the god who receives by far the greatest amount of attention, for the Kafir of the lower Bashgol is ever on the raid, always on the watch for the chance of a Mahomedan life. It is, indeed, curious that whilst tolerant enough to allow of the

existence of Mahomedan communities in their midst, they yet rank the life of a Mussulman as the one great object of attainment, so that a Kafir's social position is dependent on the activity he displays in searching out the common enemy, and his very right to sing hymns of adoration to his war-god is strictly limited by the number of lives he has taken. The hymn which these Kafirs recited, or sang, was translated word by word, with the aid of a Chitrali interpreter, by a Munshi, who has the reputation of being a most careful interpreter, and the following is almost a literal transcript, for which I am indebted to Dr. MacNab, of the Q.O. Corps of Guides :—

"O thou who from Gir-Nysa's (lofty heights) was born
Who from its sevenfold portals didst emerge,
On Katan Chirak thou hast set thine eyes,
Towards (the depths of) Sum Bughul dost go,
In Sum Baral assembled you have been.
Sanji from the heights you see; Sanji you consult?
The council sits. O mad one, whither goest thou?
Say, Sanji, why dost thou go forth?"

The words within brackets are introduced, otherwise the translation is literal. Gir-Nysa means the mountain of Nysa, Gir being a common prefix denoting a peak or hill. Katan Chirak is explained to be an ancient town in the Minjan valley of Badakshan, now in ruins, but it was the first large place that the Kafirs captured, and is apparently held to be symbolical of victory. This reference connects the Kamdesh Kafirs with Badakshan, and shows these people to have been more widespread than they are at present. Sum Bughal is a deep ravine leading down to the plain of Sum Baral, where armies are assembled for war. Sanji appears to be the oracle consulted before war is undertaken. The chief interest of this verse (for I believe it is only one verse of many, but it was all that our friends were entitled to repeat) is the obvious reference in the first line to the mountain of Bacchus, the Meros from which he was born, on the slopes of which stood the ancient Nysa. It is, indeed, a Bacchic hymn (slightly incoherent, perhaps, as is natural), and only wants the accessories of vine-leaves and ivy to make it entirely classical.

The vines and ivy are not far distant. In making a slow progress through one of the deep "darras," or ravines, of the western Kunar basin, leading to the snow-bound ridges that overlook Bashgol, I was astonished at the free growth of the wild vine, and the thick masses of ivy which here and there clung to the buttresses of the rugged mountain spurs as ivy clings to less solid ruins in England. The Kafirs have long been celebrated for their wine-making. Early in the nineteenth century, when the adventurer Baber, on his way to found the most magnificent dynasty that India has ever seen at Delhi, first captured the ancient city of Bajaor, and then moved on to the valley of Jandoul, now made historic by another adventurer, Umra Khan, he was perpetually indulging in drinking-parties, and he used to ride in from Jandoul

to Bajaor to join his cronies in a real good Bacchic orgie more frequently than was good for him. He has a good deal to say about the Kafir wine in that inimitable diary of his, and his appreciation of it was not great. It was, however, much better than nothing, and he drank a good deal of it. Through the kindness of the Sipah Salar, the Amir's commander-in-chief, I have had the opportunity of tasting the best brand of this classical liquor, and I agree with Baber—it is not of a high class. It reminded me of badly corked Chablis, which it much resembled in appearance.

Time may perhaps have further and more perfect information to lay before us about these strange people, the Kafirs. At present I cannot but believe them to be the modern representatives of that very ancient Western race, the Nysæans—so ancient that the historians of Alexander refer to their origin as mythical.

I feel that I must acknowledge my obligations to Mr. McCrindle, from whose excellent translations I have quoted freely, and whose classical research has pointed the way to some most interesting fields of inquiry in remote parts of India. His books possess the invaluable attribute of portability.

LAKE LOUISE, IN THE CANADIAN ROCKY MOUNTAINS.

By WALTER D. WILCOX.

WHILE making a hasty overland journey by the Canadian Pacific Railway during the summer of 1891, my attention was called to the remarkable beauty and grandeur of the Canadian Rockies. Again in July, 1893, in company with a college friend, I spent several weeks at Banff and Lake Louise, the latter a beautiful sheet of water surrounded by the grandest mountains along the line of the Canadian Pacific, and now annually visited by possibly one hundred tourists. Remaining two weeks at Lake Louise, we had time to attempt the ascent of the two highest mountains in the vicinity, but failed in each instance, being stopped by a vertical rock wall of great height on one mountain, and on the other by the dangerous condition of the snow, where we narrowly escaped an avalanche. We were not properly equipped for accomplishing much in a region unexplored and unmapped, where we were necessarily our own guides, and where, by reason of the heavy forests in the valleys, it is very difficult to carry a tent or provisions to any great distance from head-quarters.

The failure of this season inspired me with a desire to organize, if possible, a party for the summer of 1894, which should be equipped to thoroughly explore and survey the region in the vicinity of Lake Louise, to ascend several of the highest peaks, and to make photographs of every interesting feature. It is not necessary to dwell on the difficulties attending the organization of a party of men to travel several thousand miles to a region about which they knew nothing save what they could

gather from a few photographs and tales of my former experiences. Suffice it to say that a party, consisting of Samuel Allen, of the Swiss Alpine Club, Yandell Henderson, Lewis F. Frissell, George Warrington, and the writer of this article, all of Yale University, was induced to go, and arrived on the field early in July.

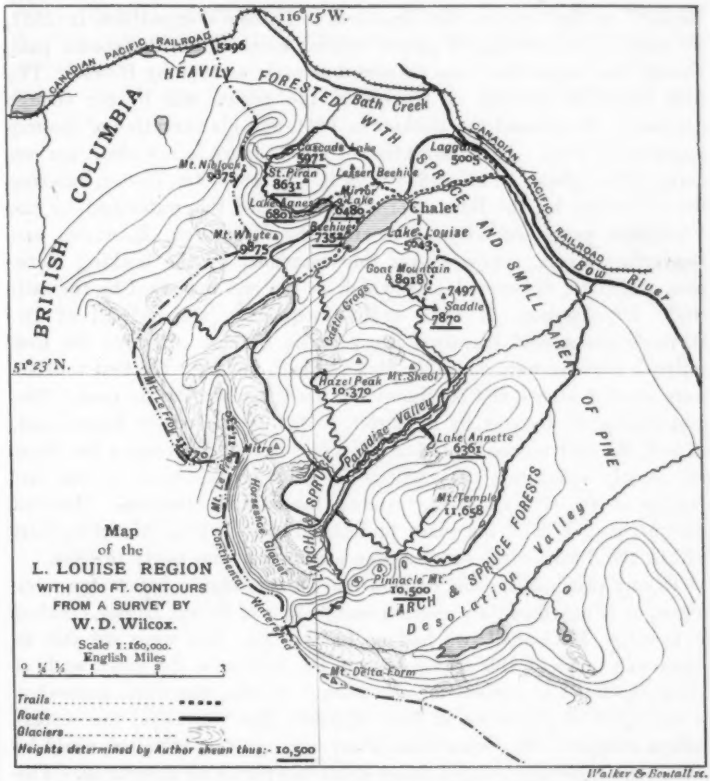
The outfit consisted of a plane table and telescopic alidade, kindly furnished by the United States Geological Survey, a prismatic compass, two steel tapes, a mercurial barometer, two watch-size aneroids, a thermometer, and compasses. For our mountain work, we had several hundred feet of manilla rope and four ice-axes modelled after the most approved Alpine form. For photography, there were three cameras and twenty-five dozen dry plates of several degrees of rapidity.

It would be in place here to define more accurately the location of the field of operations. Roughly speaking, we may define it as a region in the extreme western part of the province of Alberta, and south of the Canadian Pacific road, in lat. 51° 25′ N. The extent of the area might be approximately indicated by saying that it would all be included in the half-circle formed by the line of the railroad and the arc drawn with a radius of 10 miles from the station called Laggan. That the area thus limited should have occupied us an entire summer will appear less remarkable after a discussion of the extent and character of the difficulties presented.

From the line of the railroad at and near Laggan, one sees to the south a long range of lofty peaks in great part covered with snow and ice, and forming the grandest scenery along the entire road, the Selkirks not excepted. This is the summit range of the Rockies, the watershed of the continent, for on the other side of these mountains the water flows into the Pacific, while here the rushing waters of the Bow river are hastening toward the Atlantic. Two miles south of Laggan there is a small lake hardly 1¼ mile in length, but so beautiful in itself and in the grand mountains which surround it, that a waggon road has been opened throughout the forests to the lake, and a Swiss chalet erected near the shore for the reception of tourists. This was first occupied in July, 1894, though as early as July, 1891, there was a log-house with several rooms for the entertainment of travellers. We made the present chalet our head-quarters for the greater part of the summer.

In order to understand the topography of the tract surveyed, in a general way, it may be described as follows: The Bow river valley, running about south-east and north-west near Laggan, has an average width of fully 4 miles. The main range of the Rockies runs nearly parallel to the valley, and lies about 6 miles to the south-west of it. The area surveyed includes five short spur ranges which branch off at right angles from this summit range, and hence cause the valleys between them to open into the Bow valley at right angles. The altitude of the Bow river at Laggan is 5000 feet. Mount Temple, the highest in the

region, is 11,658 feet above sea-level. Mount Lefroy is the next, with an altitude of about 11,370 feet, and, in addition, there are nine or more peaks over 10,000 feet in height. The average elevation of the lateral valleys is about 5800 feet. Now, the absolute height of mountains is generally thought of the first importance, but those who have given any attention to the subject know that their relative height above the valleys is the criterion by which we judge their impressiveness and grandeur.



The gloomy depth of these Rocky mountain valleys, and the unusual steepness of the cliffs overlooking them, entirely redeem their inferior height, when compared with the Alps or other well-known mountainous regions. Without further discussion by way of introduction, this article will be perhaps better understood when the various subjects are treated under the heads of History, Geology, Botany, Meteorology, a short discussion of the Fauna, and of our methods of surveying. It might be appropriate to say that what applies to the small area explored,

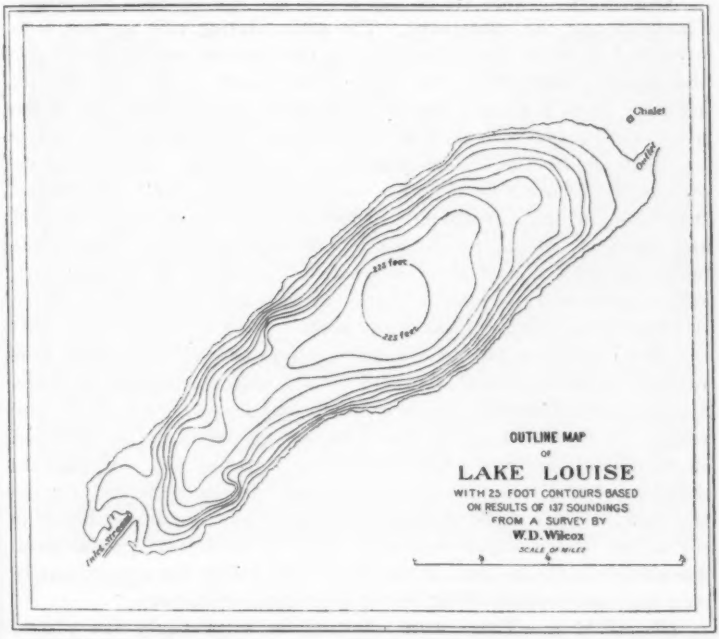
applies almost equally well to a much larger tract, and that little or nothing new could have been added if the area had been many times greater. The geological structure, of course, would vary much in every way even if a slightly more extensive area had been surveyed, except in regard to the Quaternary; the flora and fauna less so; while the climatal conditions would remain fairly constant, and only vary locally.

History.—Speaking generally of the Rocky mountains between the latitudes of 49° and 51° 30′ N., Dr. Dawson says in his "Preliminary Report" on that region, that previous to Palliser's expedition in 1857, no maps or knowledge of passes existed south of the Athabasca pass, though the region had been traversed as early as 1810 by Howse. The first published account of travels in the region was by Sir George Simpson. He crossed the Rockies in 1841, and his narrative of the trip appeared in 1847. His description of the country is not clear, nor can many of the places be identified from it. In 1858, Dr. Hector, entering the mountains by the Bow river valley, crossed the watershed by the Vermilion pass, and after following the Vermilion, Kootanie, and Beaverfoot rivers, returned over the watershed by the Kicking Horse pass, which he discovered, and which is the one now used by the railroad. Dr. Dawson, in 1874 and subsequently, retraced all of Dr. Hector's routes, and traversed many others besides. In 1881 the first railroad surveys were made in this region. In 1886 the first tourists were carried across the continent on the Canadian Pacific road. The first published account by a tourist, so far as the writer knows, and, in fact, the only accessible information on the region, except a few short and mostly inaccurate descriptions in guide-books, occurs in the last chapter of Dr. Green's book, 'Among the Selkirk Glaciers.' Here an account is given of his visit to Lake Louise, which therefore falls within the limits of the small region explored by our party in 1894.

Of any previous specific explorations in this region before our work began, or of any mountain ascents, except that of Mount Lefroy, climbed in 1890 by McConnell, we had no knowledge. Nor were we able to obtain any maps of this region, except Dr. Dawson's, the small scale of which rendered it useless for our work. It was, therefore, somewhat in the spirit of pioneers and first explorers that we visited the several valleys mapped. We were always our own guides, as no one could be found who knew anything definite about the passes or mountains. The Canadian Pacific road seems to have appreciated the attractiveness of the Louise region, and, with a view towards encouraging tourists to visit the place, have constructed a waggon road more than two miles in length, connecting Laggan with the lake. Three trails have already been made, leading from the chalet to points of interest in the vicinity.

Geology.—The formations represented are about 3500 feet of Lower Cambrian quartzites, overlaid in the higher peaks by a series of limestones attaining here a maximum section of 2500 feet. A single

trilobite, together with a few fragmentary specimens, was found at an altitude of 9500 feet while making an ascent of Hazel peak (10,370 feet, from aneroid reading). These fossils were found on a long scree slope, and though we spent some time searching for the original beds, we did not succeed. Fragmentary specimens of trilobites were also found at an altitude of 10,500 feet while ascending Mount Temple. The best specimen was identified by Mr. C. D. Walcott, Director of the United States Geological Survey, as *Zacanthoides spinosus*, thereby referring the limestone beds from which they came to the Middle Cambrian.



Folds and flexures are absolutely wanting in the whole region surveyed, except for a general but very gentle synclinal structure, having the summit range as the axis. The strata are therefore nearly or quite horizontal everywhere, except in the extreme ends of the spur ranges as they approach the Bow valley. Here there is a gentle and gradual upward tilting, indicative of an anticlinal structure in the Bow valley. The maximum dip here approaches 12°. The valleys are, therefore, formed entirely by erosion. A very interesting example of the results of aërial erosion is seen in the beautiful mountain named by us Pinnacle mountain. The wonderful slender pinnacles or columns seen on the slopes of this mountain are from 100 to 200 feet high, and

so small in diameter as to give them the proportions of a pencil set on end. There one can see these pinnacles in all stages of formation, narrow high ridges being the next to last. These have been worn down in such a manner as to make flutings and channels in the ridges, owing, possibly, to planes of fracture. A further accentuation of the channels finally pierces the ridge entirely, and it dissolves into a row of pinnacles, indicating where a ridge formerly existed. These pinnacles are further remarkable on account of their low altitude (8000 feet), showing that extensive glaciation has not existed since they were formed or nearly formed.

Quaternary.—There are no deposits of any age between the Middle Cambrian and the quaternary. The action during this age has, however, had much to do in determining the features and topography of the region. The cliffs at the base of the valleys always exhibit the action of ice to a greater degree, while those near the summits, unless near existing glaciers, show a preponderant aërial action. There is no clearly defined line of demarcation between them, and the evidence of one form of action or the other vary locally to a considerable degree. An average altitude of about 9000 feet seems to be the upper limit of any previous general glacial action. We may therefore imagine the maximum glaciation of the Quaternary to have, for the greater part, submerged these valleys and mountains with a field of ice, above which the higher mountains appeared as islands. We may also presume that the flow of the ice had, in the short valleys and in the longer Bow valley, the same general direction as the existing surface drainage. Standing on the summit of Goat mountain and looking across the Louise valley to the west, this faint line of highest glaciation can be discerned on the mountains, with a downward slope corresponding somewhat to the slope of the valley bottom. This might be deceptive but for the fact that the slight upward tilting of the strata as they run northward is cut across by the slight downward slope of the former glacial level. The altitude of the ice-level at the head of the valley was approximately 9000 feet, and probably 8000 feet at the "gap," or entrance.

Glacial Striæ.—These were observed in surprisingly few places, though constant attention was paid to their discovery. In Paradise valley, the bed rock one mile north of the present glacier is well scored and striated in and near a stream channel. This instance was, however, below the level of present glaciation. The only other striations observed in the quartzite were in the Louise valley, on the very summit of a small mountain called the Beehive, 7352 feet in altitude. Long, coarse, but shallow striations are formed here, some of which were quite faint, and only distinguished from the rest of the surface rock by lines of dark lichens growing in them. The direction of these striæ was parallel to the general direction of the valley, and shows that the ice which made these scorings was not merely local, but part of a great current setting

out of the valley. Here we have direct proof that the ice formerly existed up to a level of at least 1709 feet above Lake Louise, and 1934 feet above its bottom. Near the base of the Beehive, at Lake Agnes, a single stratum of soft red shale about 7 feet thick appears, and may be traced for some distance north and south. Though the beds of quartzite above and below show merely a rounded, polished contour, destitute of striæ, this softer stratum is most exquisitely carved with striations of all sizes down to the merest hair-lines. Apparently the quartzite was too hard to receive scratches from pebbles and boulders of its own structure. The rounding of the cliffs, however, and of all projecting knobs of rock, is almost universal in these valleys, especially on

LAKE LOUISE FROM NEAR THE END ON WEST SHORE, LOOKING SOUTH-WEST; INFERIOR PEAKS OF MOUNT LEFROY IN THE DISTANCE.

the "stoss" side, which was here usually the south-west exposure. One very fine example of glacial elasticity was discovered in the red shale referred to above. A small projecting buttress on the side of a vertical cliff had been worn down into a conical form with a flat top, some 3 feet high, and nearly 2 feet in diameter at base. This frustum was beautifully fluted and striated with vertical *spreading* lines which opened more and more toward the base. This was done by a branch glacier which occupied the Lake Agnes trough, and presumably remained some time after the period of maximum glaciation. This glacier was undoubtedly very similar in size and steepness to the glacier which now exists on Hazel peak.

Morainal Material.—Drift covers the whole Bow valley up to the base of the mountains. At the Bow river the bluffs rise 125 feet above it, and consist of typical boulder clay throughout. The river itself rests on this material, and shows no bed rock at this point. The new waggon road follows the outlet stream from Lake Louise, and gives some good sections. The stream itself has cut down as much as 100 feet in many places through the boulder clay. Many fresh pebbles and boulders were turned out in the construction of the road, which are about equally of limestone and quartzite; most all the boulders show rounding and striations on one or more sides. The largest piece was a great slab 25 feet long by 8 feet wide, and from 3 to 4 feet thick. The whole surface of the Bow valley up to Lake Louise is plainly a series of moraines. The present chalet is built on one, which makes the dam to the lake, and all the way to the Bow river there is a succession of nearly parallel ridges, presumably left by a fan-shaped extension of the Louise glacier as it retreated, and after the general glaciation of the Bow valley had disappeared. It appears that there was a long pause at the gap, during which time the glacier piled up two or three hundred feet of morainal material, and formed a dam to its own waters after it retreated. A glance at the contour map of the lake shows, from its great depth, how much material must have been transported in order to so completely choke the end of the valley. A tendency to submarine moraines is suggested by the contours at the head of the lake. The terminal moraine of the existing glacier lies about one mile south of the lake, and some 600 feet above it. The piles of moraine are about 700 feet in width, and average fully 150 feet in depth—an immense mass of material, but not at all surprising after a glance at the glacier itself, which for a mile from its snout is so thoroughly covered with *débris* as to completely conceal the ice. Some of the boulders on the glacier were calculated to weigh from 35 to 40 tons. Immediately beyond the present moraines, which have a very recent and fresh appearance, the landscape is often forest-clad, and the boulders have an aged appearance, entirely different from the oldest boulders of the moraine. When we take these points in connection with the fact that nothing that might be styled a moraine exists between the lake and the present terminal moraine, we may conclude that the retreat of the glacier from the lake-bed to its present position was too rapid and uniform to leave any traces of terminal moraines. The fact is evident, from a study of many glaciers in the Rocky mountains, that the existing glaciers are now nearly as large as they have ever been since their final retreat in the great Ice age. This is contrary to the almost universal retreat of the glaciers in Switzerland, Norway, and Alaska. Nevertheless, Dawson notes that there are universal indications of increased humidity and rainfall in this part of the Rockies, such as abnormal height of lakelets without outlets, which has killed a belt of trees on their borders—evidence of recent floods

greater than any previous ones for fifty or one hundred years, and other signs of greater rainfall. If these conditions have existed for even a few years, the glaciers would be sensibly increased.

Present Glaciation.—A reference to the map shows that the present glacier is quite extensive. The longest glacier occupies the end of the Louise valley, and is over $3\frac{1}{2}$ miles long. The structure of the rock strata is such as to cause the formation of great fields of snow near the summits of many of the mountains, which become glaciated and flow downwards for 1000 or 2000 feet at steep angles, often 45°, and then break off in great masses as the ice is slowly pushed over the precipice. This condition of things is the cause of frequent magnificent avalanches, for the hanging glaciers often exist at the top of a nearly perpendicular

LOOKING TOWARDS MOUNT LEFROY, 11,370 FEET, FROM THE SUMMIT OF COAT MOUNTAIN, 8918 FEET, FOUR MILES DISTANT.

rock wall from 1000 to 2000 feet high. The ice thus breaking off is a source of fresh supply to the glaciers below. In July and August the thunder of these avalanches is very frequent, especially before sunrise. Water freezing in the crevasses must be the immediate cause of this. The thickness of the ice in the hanging glaciers is from 200 to 250 feet. They show about twenty dark lines running horizontally in the cross-section. These are 12 or 15 feet apart near the top, but compressed to a foot or less at the bottom. They undoubtedly register the annual snowfall, the dark bands being the dirt which is brought down by slides during July and August, while the white part represents the uninterrupted accumulation during the rest of the year.

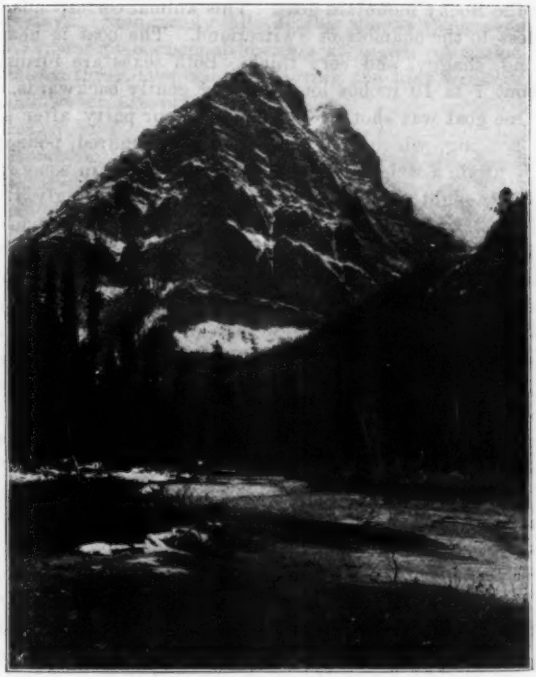
A brief *résumé* of the results of the Quaternary would call attention to a certain relation between present glaciers and existing lakes. Lake Louise is the result of a long pause of the retreating glaciers while the dam was piled up. The flat bottom of this lake, together with its very steep sides, gives the U-shaped cross-section characteristic of glacial valleys. The same relation exists between the glaciers and lake in Desolation valley, also the small glacier on the west side of Mount Temple. No lake exists in Paradise valley corresponding to Lake Louise, but a glacial dam is very apparent, and above it a long tract of level swampy land. For some reason the dam was not high enough to give the lake great depth, and this, combined with a stream charged with much more sediment than in the Louise valley, has conspired to fill up the basin and obliterate the lake which undoubtedly existed here. In this way Lake Louise is being rapidly filled, as may be seen by the well-formed delta. Moreover, for one-fourth of a mile above the head of the lake the land is quite level, and only rises 2 or 3 feet above the lake, indicating the original area of the water-surface. In July and August the muddy stream from the glacier rushes swiftly along, carrying sediment and pebbles, up to an inch in diameter, into the lake, depositing the heavier particles on the delta, and sending a line of discoloured water far out into the lake, the deep blue-green waters of which become quite milky toward the end of summer. The lacustrine deposits are of unknown depth, but consist of a dark blue, somewhat arenaceous clay, which covers the bottom everywhere.

Flora and Fauna.—These were not studied at all, though it was our intention to make a collection of plants if there was time enough. A distressing accident during a mountain ascent delayed the surveying work so much that this line of study had to be given up. However, some of the more important and interesting plants and animals that came before our attention will be mentioned.

Flora.—The almost universal forest tree from the Bow river up to the tree-line is Englemann's spruce. This tree forms a rich and luxuriant dark forest wherever the slopes are not too steep to support a thin soil. They average 75 feet in height and about 15 inches in diameter. This tree is occasionally replaced in part by small areas of the black pine. The Lyall's larch can only contest on equal terms with the spruce at about 6800 feet above sea-level, and from there up to the tree-line, which is here about 7400 feet. It might be mentioned, in connection with the tree-line, that the snow-line, as determined by the limit of névé on the glaciers of this region, lies somewhat lower, approximately 7000 feet. One or two snow patches remained near the shores of Lake Louise (5643 feet) till August 1.

There are only a very few deciduous trees, which appear chiefly along the banks of rivers or in open sphagnum swamps caused by slight morainal dams, and also in the clearings made on the mountain slopes

by snow avalanches in winter. A few bushes, and especially the numerous herbaceous plants, make a most beautiful and brilliant floral display during July and August. Epilobiums and Castilleias line the barren, gravelly flood courses of glacial streams, and make a bright but discordant array of magenta and scarlet flowers. A species of Myosotis grows very abundantly in the valleys. *Aquilegia Canadensis*, which is scarlet in the eastern states, here grows yellow throughout. The forests are filled with multitudes of elegant flowering plants, of which none



ENTRANCE TO PARADISE VALLEY, LOOKING SOUTH OF WEST. THE FOREGROUND REPRESENTS THE FILLED UP GLACIAL LAKE, CORRESPONDING IN POSITION TO LAKE LOUISE.

is more widespread or more attractive than the one-flowered Pyrola (*Moneses grandiflora*). As in all Alpine regions, the plants seem more brilliant in coloration as the snow-line is approached. Many dwarfed forms of plants, chiefly Compositæ, grow on peaks and slopes over 8700 feet above tide, while a species of anemone, though growing lower, often seems to push its eager stalk through the edges of retreating snow, and blossom within a few yards of snow that is almost perpetual. No adequate idea, however, of the number and variety of flowering plants in these mountains could be conveyed without the aid of a systematic

list, which unfortunately is not at hand. It might be stated that the vegetable life is a feature of the greatest beauty, no available spot, from valley bottoms almost to the limits of vegetation, is left unoccupied.

Fauna.—A great number of interesting animals were either seen or their tracks observed—the black bear, mountain lion, lynx, wolverine, porcupine, weasel and marten, several species of rodents, squirrels, rabbits, marmots, and a number of small rat-like animals inhabiting the rocks in Alpine regions. By far the most characteristic animal in the region is the Rocky mountain goat. This animal corresponds in habits and shyness to the chamois of Switzerland. The coat is nearly snow-white, long, shaggy, and very thick. Both sexes are furnished with horns about 7 to 10 inches long, curving gently backwards, and very sharp. One goat was shot by a member of our party, after six weeks' constant hunting, which weighed about two hundred pounds. They are said to attain a weight of three hundred pounds in some specimens. In all, twenty-eight goats were seen by us, several singly, the rest in herds of five, six, and eleven respectively. They are a magnificent animal, inhabiting the loftiest mountain slopes, and running with ease and indifference along precipitous ledges and places impossible to man. Endowed with wonderful faculties of scent, sight, and hearing, and being, beside, very timid by nature, they are a most difficult animal to hunt, and will naturally preserve themselves for many years, as few hunters have the patience or fortitude to get near enough for a shot.

Lake Louise and its outlet is quite full of small trout, which do not ever attain to more than 10 inches in length, but are very excellent for the table.

The forests are full of a great variety of birds, many of which sing the greater part of the summer. In the deeper woods are found a species of pheasant called the blue grouse, and along with these, and also more frequently in the "alps" and rocky slopes of lesser mountains, a species of grouse called by some ptarmigan, and by others the fool hen. Both these birds are good eating, and, when fired at, will usually remain quite unmoved until killed. Hence the name of the species.

Great flocks of black ducks, mallards, and divers visited the lake during August and September, as many as fifty being seen at once from the chalet.

The entomology of the region has been almost exhaustively studied by Mr. Bean, a telegraph operator at Laggan. He has a large and exceedingly valuable collection of beetles and butterflies. Some of the species found at great heights are identical with those discovered in the Arctic regions, and never found outside of those places before or since, except on these mountain summits.

The insect life has a most important and serious bearing on the traveller in the shape of mosquitoes and horse-flies. The mosquitoes are well-nigh innumerable, and constitute the only drawback to this

otherwise ideal mountain region. They entirely disappear every year after August 12 or 15.

Meteorology.—One of the most important considerations in a mountain region is the character of the weather during the summer season. Whymper has written, in his book on the great Andes of South America, sufficiently about the persistently rainy character of the weather there to deter almost any one from visiting those mountains with the intention of mountaineering. During July and August the weather in the Canadian Rockies is unusually steady, with a great preponderance of clear sunny days. Rain rarely falls during the six weeks from July 1 to August 15, except occasional showers at night. A period of rainy weather lasting three days occurred during the first week of August, which was, however, exceptional.

MOUNT TEMPLE, 11,658 FEET, FROM THE "SADDLE," LOOKING SOUTH.

Over two hundred observations of the mercurial barometer and thermometer were made from July 25 to October 9 inclusive. Daily observations were made, and, whenever possible, as many as three, at the hours of 8 a.m., 2 p.m., and 8 p.m. The maximum emperature observed was 78° on August 19; the minimum on September 22 and October 6 being 21°. The hottest week fell between August 17 and 23 inclusive, when the morning and evening readings averaged 57° and 58° respectively, and the 2-o'clock readings 74°. From these data it may be seen that the tourist and mountaineer have no hot valleys

from which to start their exploration or ascents, as is the case in Switzerland. A cool, dry atmosphere, most remarkably lucid, and a deep-blue sky, coloured to the most distant horizon, are the normal conditions. The south-west is the quarter from which the prevailing wind blows, though this is a difficult point to ascertain in a narrow, deep valley where the mountains must influence the lower air-currents to a great degree. The month of June is one of the worst of the year, rainy, changeable weather being the rule. Snow may be expected by September 15 in all but the lowest valleys. Consequently, the summer season is very short. A brief consideration of the astronomical conditions will solve this at once. The latitude of this region (50° 25′) is so high, that during summer the sun is above the horizon three-fourths of the day. Twilight continues throughout the night as late as July 6, the time of our arrival. Hence the shortening of the days towards the equinox is very rapid, and winter sets in very suddenly. The moon is rarely seen, and never at the full until the latter part of August. Hence we may conclude, inasmuch as the sun occupies the same part of the ecliptic in winter as the full moon in summer, that there are several months near the winter solstice during which the sun practically *never* rises in those narrow mountain valleys. The cold of midwinter is intense, but probably no more so than in the plains to the east, where the thermometer at times falls to 65° or 70° below zero Fahr. Snow was almost constantly on the ground at the level of Lake Louise after September 15, but this was said to be unusually early. During the summer months snow may fall above the level of 9000 feet at any time, and frosts often occur in the valleys.

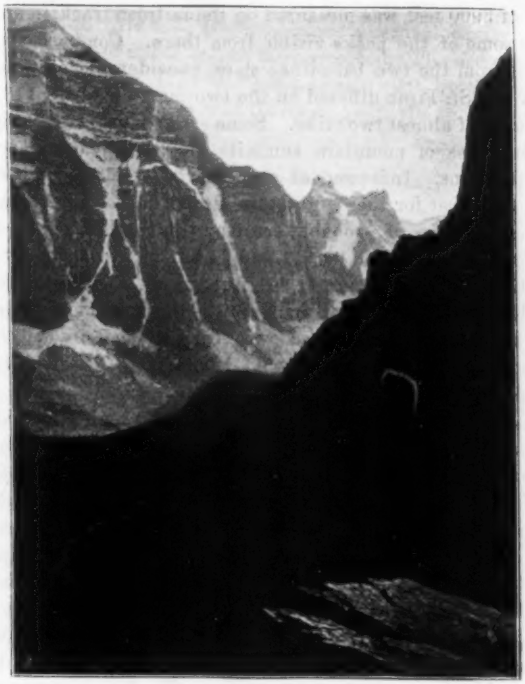
It is difficult to judge of the total precipitation, as no reliable data are at hand. The snow is said to be 6 or 8 feet, or even 10 feet, on a level in the valleys during the winter. Owing to the tendency for the maximum precipitation to take place on and near the highest mountain, this fall would be much increased over the névé regions. From sections of hardened snow, which, having a glacial flow, were crowded over a precipice and so caused to break off, the average depth between the dark bands referred to above as showing the annual snowfall seemed to be about 18 feet.

In regard to dangerous and sudden storms, only two instances were observed of sudden formation of clouds below the mountain summits, and in both these cases the barometer gave ample warning.

A few remarks might be made under this topic in regard to forest fires. These originate, in great part, from the railroad, but also from careless hunters and prospectors, who are, indeed, accused of wilfully firing the forests to open up the country, and more rarely from Indian hunters. A certain cause, but probably rare, is lightning. An authentic instance was reported last summer of a gentleman who saw a lightning flash, and, shortly after, fire in the forest where it struck.

Hundreds of miles of forests have been already consumed, and the danger is always present and apparently increasing. The smoke from these fires, though often 50 or 100 miles distant, obscures the atmosphere more or less almost one-third of the time during July and August.

Methods of Surveying.—The surveying was done by means of plane-table and alidade, the latter furnished with a powerful telescope. A base-line of 600 feet was first measured with a 50-foot steel tape on the shore of Lake Louise. This was the longest possible straight level place



MOUNT TEMPLE, WITH LESS FOREGROUND, TO SHOW THE DEPTH OF VALLEY.

to be found. A series of small cairns built of flat stones was constructed to a height of 18 inches above the water-surface, having been first roughly aligned by the alidade. These were 50 feet apart. Smooth, flat stones capped each of these, and by means of the alidade sighting on a plumb-line, marks were made on these in alignment. A steel tape was used to measure from one cairn to another. This was repeated a number of times, and then movable signal flags were placed at either end of the base-line. The lake was then mapped very carefully by

means of a great number of signal flags. This work required over three weeks. The lake was afterwards sounded, mapped, and contoured from 137 soundings.

After the lake was mapped, a one-inch scale map was started, and two of the lesser mountains located. The plane-table and alidade were then carried to the summits of each of these mountains, not, however, without considerable labour. The principal features of the area were located from these points, and the streams, etc., sketched in from over 120 photographs taken in all parts of the region. Subsequently, another base-line of 3900 feet was measured on the railroad track, in order to get angles on some of the peaks visible from there. Comparisons between the results from the two base-lines show considerable accuracy. Goat mountain and St. Piran differed on the two maps by about 118 feet on a total distance of almost two miles. Some errors must creep in on account of the bluntness of mountain summits and their varied aspect from different positions. Independent angles with a plotted distance gave 8876 and 8880 feet for the height of a signal flag on St. Piran, a result far within the limits of probable error by this method. The height of Mount Temple resulted in 11,611 and 11,691 feet from the two ends of the base-line. These average 11,651 feet, which is within 7 feet of the calculated height. It was not known until this result had been worked out that the mountain measured was Temple, and, in fact, this close result first excited the suspicion that led later to a knowledge of its previous measurement.

Conclusion.—The characteristic features of the region by which these mountains and the Canadian Rockies in general are differentiated from other mountain regions, as the Alps, Andes, and Himalayas, are found not so much in the geological age and nature of the strata as in the extent and character of those erosive forces which have resulted in forming narrow, deep valleys, often with precipitous rock walls of great height and grandeur, thus making the mountains relatively very high. Added to this, climatic conditions sufficiently moderate in summer to tolerate, and humid enough to encourage, a rich vegetation, there results a fortunate combination of beauty and grandeur which has already begun to attract the admiring attention of travellers. The by no means excessive precipitation of snow is offset by a long period of nearly ten months for accumulation, resulting in extensive glaciation on the higher peaks. As these points are favoured by the addition of a clear, cool, and invigorating atmosphere, there is but little doubt that the Canadian Rockies will enjoy an ever-increasing popularity and favour among travellers and mountaineers.

ACCOUNT OF A VISIT TO NIUAFOU, SOUTH PACIFIC.

By Lieut. BOYLE T. SOMERVILLE, of H.M.S. "Penguin."

[The small island of Niuafóu, which lies by itself in the Pacific, about midway between the Fiji and Samoa groups, is a part of the dominions of Tonga, though separated from those islands by more than 200 miles. It is seldom visited save by small traders, and, though it has been known to present a remarkable instance of that class of volcanic island which has blown off the shell covering the vent and excavated interior, and left a mere ring—in this case perfect—round a central cavity, no very complete description of it has before been received. The account (dated "H.M.S. *Penguin*, August 17, 1895") of a recent visit by the officers of H.M. surveying vessel *Penguin* will therefore probably be interesting.—W. J. L. Wharton.]

1. General Description of the Island.

Niuafóu island is the northern limit of the Tongan dominions, and lies in lat. 15° 34′ S., long. 175° 41′ W. It is almost circular in shape, being by an estimation given in the Sailing Directions, about $3\frac{1}{2}$ miles by 3 miles in diameter, and rises to an average height of 350 feet above the sea, with six or seven moderately marked elevations, the highest of which is 588 feet. It is thickly covered with vegetation throughout, with the exception of one place on the south-west of the island, where a lava stream, recently formed, has not yet received its coating of green.

The inhabitants, about 1000 in number, live in nine villages, all on the seaboard. They are Tongans, with a few emigrants from Uea, or Wallis island, and are all Christians, either of the Tongan State religion, Wesleyan, or Roman Catholic denominations.

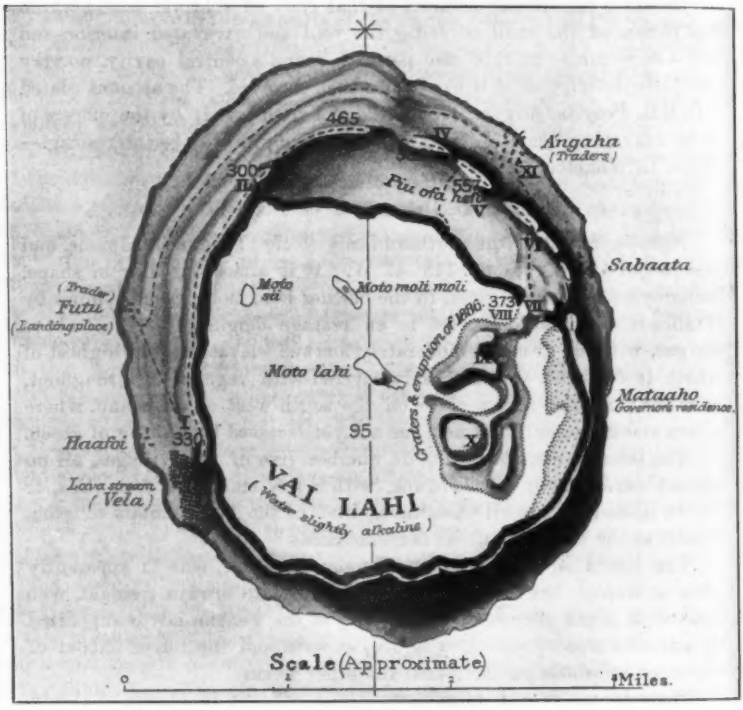
The island is under a native Tongan governor, who is apparently often at Hapai; but there is a native magistrate always resident, who deals with minor offences. The majesty of the Tongan law is supported by a small corps of police, who also superintend the forced labour of convicted criminals on the roads, and other works.

There is one French missionary priest resident in charge of a very small flock, who, with two English traders and one German, form the white population. Mr. Tarris, the principal white trader of the island, has lived here for over twenty years, but at the time of our visit was away at Tongatábu on matters of business.

The principal village, Añgaha, is on the northern side, just below the highest part of the island, and is conspicuous from seaward by the white houses of the traders, two native churches, and their native pastors' dwellings, etc. The next largest village, Sabaata, is a little distance round to the eastward, and further still in the same direction is Mataaho, where the governor's house is situated, almost facing full to the south-east trade wind. On the south-west is a village called

Haafoi, just below the lava stream before mentioned; and further round again, on the north-west, is Futu, the best landing-place in the south-east trade season, where the third trader has his establishment.

The whole coast-line is bounded by the most forbidding black lava rocks, on which the white surf continuously breaks. Opposite Futu, however, and at Aúgaha also, the lava has conveniently poured itself out seaward in the form of short rough jetties; and landing may more



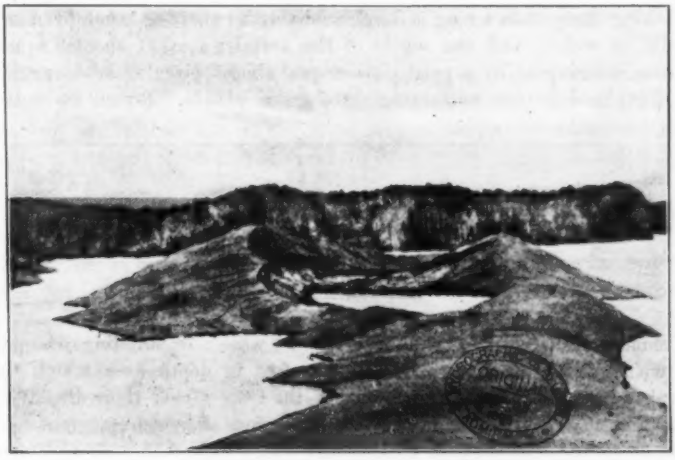
PLAN OF NIUAFÓU (FROM EYE-SKETCH).

or less easily be made on these, when the tide is suitable and the wind favourable. Probably there are more places of similar form facing the other villages, for a Norwegian barque recently spent a month at the island, during which time she loaded over 500 tons of copra, anchoring in front of each village in turn for that purpose.

The anchorage is, however, said to be very inferior all the way round, the bottom being foul ground; and there are over a dozen anchors and various lengths of cable known to have been left behind on the bottom by vessels calling here for trading purposes.

2. Account of a Day's Expedition through the Island.

We landed on the natural rock jetty opposite Futu on the morning of August 17, 1895, a party of six officers, and were met by a number of natives, standing among whom was a white trader, Mr. James Yarndon. The French missionary, hearing that a man-of-war of some description was off the island, and expecting daily a brother priest by the next one of his own nation that arrived, had hurried round at daybreak the 4½ miles from Angaha, where his house is. We saw him inspecting us from a little distance as we landed, and no doubt he was exceedingly disappointed at viewing the inevitable knickerbockers and unmistakable boots of the English tourist. We met him a few minutes



VIEW OF CRATERS AND ERUPTION OF 1886, FROM ABOVE ANGAHA.

afterwards, but he was all welcoming smiles and bows of greeting by that time.

We knew that there was a lake in the centre of the island, and that traces of recent volcanic activity were to be seen at one spot; so, placing ourselves under the guidance of Mr. Yarndon, who kindly undertook that office, we started off along a very fair road to view these natural curiosities, luncheon-bag and camera following with a native on a horse, of which we were surprised to find a great many on the island, the luxuriant grass everywhere affording capital feed.

Our path, wide enough almost for two carts to pass, led under the pleasant shade of the trees, and struck off first to the southward, with a general rise. After a little over a mile, it brought us into an open space, with a steep pinch of hill on the inner side, and a large area of black

lava, the stream before mentioned as visible from the sea; on the other, dotted with little islands and oases of green.

Some portions of this place are still heated, and the whole district is called "Vela," signifying "hot." It is unwise to walk over it unless accompanied by a native, as there are various quicksands and other dangerous spots scattered throughout its extent. We did not adventure on to it, intending to go there if possible before returning to the ship in the evening (which, however, we were unable to do); so, turning to the left, we spurted up the short steep path which confronted us on that side, which led upwards amid taro and banana gardens.

Suddenly we were on the top, and, on going round, were filled with surprise and pleasure at the unexpectedly beautiful scene which lay in front of us. The island, which now lay mapped before our eyes, is nothing more than a ring of land, probably nowhere as much even as a mile in width; and the whole of the interior area, of about 3 square miles, is occupied by a most picturesque, almost circular lake, roughly 2 miles in diameter, containing three green islands. Round its entire

VIEW FROM 330 FEET SUMMIT ABOVE HAAFOI VILLAGE.

circumference from the ridge on which we were now standing, dropped down a sheer precipice, 200 and 300 feet in depth, over which the exuberant foliage and huge creepers of the tropics cast their display of leaf and blossom. From amidst this profusion of greenery, great bare shoulders and buttresses of rock thrust out, which, forgotten ages ago, must have looked down on the hideous molten mass of mud and rock, heaving and seething in the huge crater basin of fire below, now covered by the peaceful lake.

The spot where we were standing was 330 feet in height by the aneroid, and this is about the average even height of the great crater lip; but there are several summits on the ridge, mostly on the northern and eastern sides, and it is also varied by a rather marked dip which occurs abreast of the lava stream near this first position.

The lake appeared to be almost circular; the regularity was broken in one place only by the upheaved ground of the eruption of 1886, the bare reddish surfaces of which we could just see 2 miles away to the eastward. A photograph was taken from this spot, but as the trade wind was blowing with unusual force, driving swift showers and clouds across the sky, the unsteadiness of the camera prevented the plate from doing justice to the scene.

We arrived on this part of the ridge at 8.30, and, after a short halt, proceeded along the crest by a very fair path to the northward, gradually circling round to the scene of the last eruption.

Specimens of rock and surface sand were collected at various positions; but, owing to the depth of the rich soil even here on this narrow edge, it was only rarely that geological specimens presented themselves on the surface. The soil of the island-ring is evidently of the richest, most prolific nature, and this has been taken every advantage of by the natives. Garden after garden of banana, taro, and other tropical food-plants met our view in all directions; and what at a distance appeared to be bush, on closer inspection became a very forest of coconut palms, of which there must be some millions on the island. It surpassed all of our previous experiences of tropical cultivation or extent of coconut groves.

The northern arc of the island is wider across than elsewhere, and though it rises up steeply enough from the seaboard, there is, after the first precipitous dip on the inner side, a nearly flat area—not inhabited, but largely cultivated—which then dives down to the lake-edge by a native path, only just possible to be scaled.

The path above then leads to the highest part of the ridge, where there are two summits near one another, of which the aneroid gave 588 and 557 feet as elevations respectively. The second of these is crested by a flat grassy mound, the grave of some chief's wife of an earlier day; and here we had a pleasant spell, it being now 11.30, though the heat of the sun was considerably tempered by an unusually strong and squally trade wind.

This summit is called Piu Ofa Hefa, and from it we could see, almost perpendicularly below us, Angaha, the principal village of the island, with its clean huts and houses dotted on the grass, bordered by the foam-edged rocks of the seaboard; beyond them again the white horses of the south-east trade swell; and there, rolling along before the wind, the *Penguin*, steaming slowly round the island, and stopping every now and again to sound. Inside, the lake lay spread before us with its three islands, Moto Lahi, Moti Moli Moli, and Moto Sii, named in order of size. Moli Moli is said to have a small crater of its own containing fresh water, a lake within a lake. Close on our left, on the south-south-east of the island, was the oddly shaped barren peninsula formed nine years ago, from which dense clouds of white smoke-like dust and sand were being driven by the wind into the big lake.

Having refreshed ourselves with many green coconuts, we started down for this spot, descending by a steep ravine-like path which quickly brought us into the land of desolation, the sudden edge of trees and rich undergrowth stopping dead like a wall, so that one step brought us out of a garden, as it were, into the desert. We first crossed an area of stones and cinders lying on apparently hard mud; and, having

passed this, we paused again for a little on a sandy summit, which completely overlooked the whole scene of activity, at a height of 373 feet, and sketch-book and camera were quickly at work. The hill dropped down very steeply below us, with a few small casuarinas, the first sturdy pioneers of the advancing forest, scattered on its slope. Down in the valley were the still standing white stumps of trees overwhelmed in the eruption; and beyond, on the other side of a lower smooth round hill, we could just see the circular pits with their seamed ashy sides—the nearer one broken down into the big lake, but the further smaller one separate, each filled with water—the craters of activity of August 31 and seventeen succeeding days of 1886. The whole of this scene was upheaved from what had previously been the lake bottom during that period, and forms a peninsula, with a long narrow gulf running nearly parallel to the south-east side of the periphery of the island. The natives have begun to plant coconuts on the lower ground already.

We quickly descended the steep sandy hillside to the shore of the lake, the aneroid giving its elevation as 95 feet above the sea-level. The water does not appear to be exactly salt to the taste, but rather alkaline—not very unpleasantly so—and the horses on the island will drink it, which, as there are no streams nor any fresh water but rain to be had, must be a good saving in times of drought. It is said that there are no fish in the lake, nor does there appear to be any vegetable growth, except for a small feathery plant which we saw a foot or so below the surface, growing on the edge of the sand. The lake, which is called "Vai Lahi" (or great water), is supposed to be very deep, and there is a tradition of a sounding of 100 fathoms with no bottom, which, however, requires confirmation.

There is a small white alkaline deposit a few inches below the present water-line like a low-tide mark, so that it appears as if the surface of the lake varied its level occasionally. The surface soil of the peninsula does not appear to be volcanically heated, but, on thrusting the hand into the soft black sand at the water-edge to a depth of 2 or 3 inches, it was found to be very decidedly hot—not less, probably, than 150°.

As the leaders of our party rounded one of the points of the peninsula, a great flock of wild duck rose within easy shooting distance, but had soon put themselves out of range. Unfortunately, there was no gun in the whole expedition, or no doubt we should have had something more eatable than geological specimens to show for our trip.

Another bird, said to be alone found on Niuafóu, is called by the natives "malau," and is apparently of the same order as the megapodes, as it makes no nest, but buries its eggs for hatching in the soft hot sand of this volcanic spot. It is a bird of about the size of a rather small ordinary fowl, and shape of a guinea-fowl, with a small head, and strong pink legs and feet. It is of a russet-brown colour, the head, neck, and some of the back being a dark slate. Its eggs are large, of a

dull reddish colour; a thin skin, containing the pigment of which, covers the white shell underneath, and can be peeled off without difficulty. The eggs much resemble, both in size and appearance, those of the megapode.

We at length scrambled over the last ashy ridge, and found ourselves on the smaller but separate crater basin, all the steep sides of which, 100 to 200 feet high, were deeply fissured, being composed of a crumbling material which broke away under the foot; and we sat down to lunch on the edge of the water at the bottom, which was roughly circular, and about 400 yards in diameter.

The other crater must have been much larger and probably more elliptical; the neck by which it joins the big lake has high steep sides, but the ridge which separates it from the lesser bowl is not more than 50 feet or so in height. Thus both may be said to belong to the same main orifice, but separated by a small partition.

It was now 1.30. The sun was baking down on this barren, shadeless spot, and hardly any of the wind reached us; so, without waiting long, we returned by the same route as we came to the first bare summit, the final exceedingly steep hill of loose sand being particularly exhausting. We threw ourselves down by the side of a small casuarina shrub, while a native, who had attended us as porter, went for coconuts.

The long cool refreshing drink from these soon revived us, and we were shortly mounting the steep ravine path we had previously descended, in the welcome shade of the trees, to the upper ridge. Thence we descended as steeply to the sea-coast, to the village of Angaha, where having been courteously received by the two white traders there, Messrs. Plati and Sheren, and having been shown a live "malau" bird, almost tame, in a cage, we set out, laden with the island mail for Tonga, on the homeward route. This lay along a capital road about halfway between the ridge path we had come by and the sea; and we passed many natives returning home with their garden produce for Sunday, it being Saturday night, some walking and some riding, who all greeted us with the cheerful "Malo lelei" of the Tongans as we passed them.

It would be hard to describe the extreme beauty of this road, the rich dark mould on both sides yielding a garden border of ferns and flowering shrubs, overshadowed by immense leafy trees; or where, for a considerable distance in front, we could see the path stretching along in the orderly perspective formed by the grey trunks of coconut palms, a full crop of nuts in all stages of maturity clustering under their feathery waving crests.

We at length arrived at Futu at 4.45, to find the ship waiting, and our boat lying alongside the landing-place; so, with many thanks to our guide who had conducted us all day, and after a hurried purchase of baskets of delicious green oranges, lychees, etc., from the natives, we pulled off to the ship, thoroughly agreed in having spent a most interesting and delightful day.

RECENT GEOGRAPHICAL BIBLIOGRAPHIES

By HUGH ROBERT MILL, D.Sc.

THE problem of keeping a systematic account of each literary flake in the ever-thickening snowfall of geographical memoirs becomes more puzzling every year. Attempts to solve it, either completely or partially, are made by most of the great geographical societies of Europe, and by some of the leading journals. Usually the attempt takes the form of a list of the works received by the society during the preceding month, quarter, or year. This may be a mere record of titles without arrangement or comment, or it may consist of a series of somewhat lengthy reviews of the works in question. The *Geographical Journal* has aimed at two things in dealing with the accessions to the library of the Royal Geographical Society: first, to present a classified list of every geographical contribution received, with only the briefest comments; and, second, to give a special notice in the body of the *Journal* of the more important or more interesting works.

The advantage of separating reviews and bibliographical notices mainly affects the student, to whom a clearly arranged and compact list of the most recent publications is a matter of high importance. The book-notices in this *Journal* are really instalments of two catalogues, one arranged according to subjects, the other according to the names of authors. The alphabetical order of the subject-entries, which prevails under each of the main divisions, is merely for the convenience of the printer. In a bibliography published monthly it is obvious that the space occupied should vary according to the demand upon it, and this being sometimes impossible without sacrificing the advantages of other equally important parts of the publication, various difficulties and inconveniences arise. *Petermann's Mitteilungen* gets over these difficulties by paging the critical bibliography separately from the general text, and giving the main headings in definite order in due succession, perhaps only two or three of them appearing in a single number. This arrangement is very satisfactory, especially when the volume is completed and supplied with the admirable alphabetical and subject-indexes which are provided. A somewhat similar method is employed, though the intervals of publication are longer, in Wagner's *Geographische Jahrbuch*, which contains special bibliographies of various departments of geography embracing the publications of several years.

The special purpose of this article is to draw attention to two recently published efforts to improve the recording of current geographical publications, one German, the other French.

For many years the Berlin Geographical Society issued an annual supplement to its *Zeitschrift*, containing a list of the publications of the previous year. From 1853 to 1887 this was done by the society's Librarian, Dr. Koner, and after his death it was continued by various

hands until 1890, when the publication stopped. The society has, however, resolved to resume and continue the work in a more systematic and complete manner than before, and for this purpose it has secured the assistance of Herr Otto Baschin, of the Prussian Meteorological Institute. The first instalment of the new work is now before us,* and it will quickly be brought up to date by the issue of volumes for 1893 and 1894. An attempt is made to give a complete catalogue of geographical publications in all languages for the period of 1891–92, and it is remarkably successful. The term "geography" is interpreted liberally, Herr Baschin preferring to run the risk of giving too much rather than too little. Books, maps, and articles in journals are all entered under certain strictly defined divisions, the ultimate arrangement being alphabetical according to the authors' names, or in anonymous works according to some descriptive word apparently chosen arbitrarily.

The classification adopted is first into A, General, and B, Special Geography; the latter is, of course, the more voluminous. General Geography is subdivided into eight groups: (1) Bibliography; (2) Methodology and Education; (3) General Description, including dictionaries, gazetteers, and handbooks; (4) Historical Geography in eight minor divisions, which include Biography and Terminology; (5) Mathematical and General Physical Geography in eight minor divisions—General, Cosmology, Mathematical Geography and Cartography, Geophysics, Climatology, Oceanology, Mountain Study, and Land Waters; all these are subdivided; (6) Biological Geography; (7) Anthropo-geography; and (8) Instructions for Travellers.

In this scheme commercial geography comes under Anthropo-geography. The arrangement is throughout scientific; only we should be inclined to separate Mathematical from Physical Geography, treating them as two main heads, and to class "Globes, Atlases, and Maps of the Earth" along with Geographical Dictionaries and Manuals in Group A, instead of following Herr Baschin and giving them the first place under Special Geography.

Special Geography has ten great divisions: (1) Globes, etc.; (2) Descriptions of large parts of the Earth, *e.g.* Empires and Colonial Possessions taken as wholes; (3) Europe; (4) Asia; (5) Africa; (6) Australia and New Guinea; (7) Polynesia; (8) America; (9) Polar Regions; and (10) Seas. Each continent is first treated by itself under the heads: (*a*) Chorography and Travels, (*b*) Geodesy, (*c*) Physical Geography, (*d*) Biological Geography, (*e*) Anthropo-geography, (*f*) Historical Geography, (*g*) Guide-books, (*h*) Maps. Each country is then taken separately under the same heads, the ultimate classification being alphabetical by authors' names.

* 'Bibliotheca Geographica. . . . Bearbeitet von Otto Baschin unter Mitwirkung von Dr. Ernst Wagner. Band 1, Jahrgang 1891 und 1892. Berlin: W. H. Kühl, 1895.

The work has been done systematically and thoroughly, and the *Bibliotheca Geographica* promises to become the one indispensable record which the practical geographer must always have at hand. The present volume contains nearly 14,000 entries. It would be too much for human power to make it free of error; the misprints we have noted are, however, of a trifling kind. Titles from slavonic languages are given in German or French translation, but for the rest each title is an exact transcript. When a number of volumes of this Bibliography has been published, the labour of referring to them will become great, and we would suggest that arrangements might be made through the Berlin Society by which copies of the work might be supplied in sheets, printed on one side only, to those societies or libraries where the method of card-catalogues is in use. If this were done for each year's accessions to literature, the entries could readily be cut up and rearranged so that a single reference would answer the common questions as to which is the latest or the most important book on a given subject. When the Committee on International Geographical Bibliography, appointed at the Sixth International Geographical Congress, reports at Berlin in 1899, they will probably give an opinion as to how far the volumes of the *Bibliotheca Geographica* are likely to fulfil the conditions demanded. We do not think that the arrangement adopted is perfectly adapted for a bibliography dealing with many years of literature; but for the accessions of a single year it is probably the best that could be found, and the geographers of the world are laid under a permanent debt to the Berlin Society.

The Bibliography of Geography for 1894 recently published by the *Annales de Géographie*, a journal which has maintained a uniformly high standard of scientific excellence since its foundation, may be compared and contrasted with the larger German work. It consists of 1590 entries, perhaps one-quarter of the geographical publications of the year, calculated on Herr Baschin's system of inclusion; but these are carefully selected, and each title is followed by an explanatory or critical note. MM. Vidal de la Blache, Gallois, and De Margerie direct the work,* and there are thirty-nine contributors, the work being in large degree international.

Like the *Bibliotheca*, the larger divisions are grouped according to subject, the ultimate order being alphabetical; the main cleavage is naturally into General and Regional or Special. The General part is treated under four main heads: (1) Historical, in two subdivisions. (2) Mathematical. (3) Physical Geography, in six minor divisions—Geology and Orography, Climatology, Botanical Geography, Zoological Geography, Oceanography, Rivers and Lakes. (4) Political Geography, comprising four sub-heads—(*a*) Races, States, and Nations;

* *Annales de Géographie—Bibliographie de l'Année*, 1894. Pp. 294. Paris: Armand Colin et Cie. 1895.

(*b*) Movement of Population and Colonization; (*c*) Products and Ways of Communication; (*d*) Educational and General.

The Regional part is divided into Europe, Asia, Oceania, Africa, America, and Polar Regions, each subdivided according to countries or groups.

The classification is not so minute as that in the German work, and some of the divisions are consequently vaguer; but the much smaller number of entries dealt with prevents this from giving rise to any real difficulty, the object of such classification being to break up the mass of references into a number of blocks readily arranged for reference, and each small enough to present its contents at a glance.

It is, perhaps, necessary to point out the difference between a systematic Bibliography aiming at the inclusion of every publication upon a given subject, and the incomplete record which a list of accessions to a library inevitably presents. Yet, if arrangements could be made for effective co-operation, a single complete list compiled by one central authority, with numbered references, would form a catalogue for all; each individual library would only require to print an index showing the numbers corresponding to the works contained in it.

THE LAND OF THE BATAKS.*

By Baron ANATOLE VON HÜGEL.

A NEW book which gives the results of actual research in any of the less-known regions of the Malay Archipelago is always welcome, and the pleasantly written volume under consideration is no exception to this rule.

Baron von Brenner divides his book into three sections. In the first, we make acquaintance with the life of the Dutch planter, the Chinese labour employed on the plantations, and with the cultivation and preparation of the tobacco in Deli, a province in the north-east of Sumatra. In the second, the author gives, in journal form, a detailed account of his month's visit to the Batak highlands. Accompanied by a Dutch assistant, two native guides, and a number of carriers, Von Brenner left Bekalla (Deli) on March 19, 1887, and after a three days' march reached the tableland, the coast mountain range being crossed by the twelfth Kota Pass, a steep pinch near the active volcano of Si Bajak. For eleven days he travelled among the friendly Karo tribe. From the extinct crater, Tandok Benua (5970 feet), a magnificent view of the lake of Toba and of the surrounding country was obtained. On April 14, the expedition embarked in a large native canoe from Negori, a village of the Timor tribe, on the north shore of the lake, for Balige,

* 'Besuch bei den Kannibalen Sumatras. Erste Durchquerung der unabhängigen Batak-Lande.' By Joachim Freiherr von Brenner. Würzburg: Leo Woerl. 1894. Large 8vo, pp. 388. *With* 2 *maps*, 7 *plates* (6 *coloured*), *and over* 100 *engravings.*

the Government outpost at its southern extremity. The travellers were ill-received by the natives on the east and south coast of the large Toba island; but, though virtually made prisoners at one of the villages and deserted by their canoe-men, they reached, without mishap, their destination on April 22. From Fort Balige, a two days' ride along a good road brought the expedition to Siboga, a town on the west coast.

The third part of the book, which, in bulk as in interest, is by far the most important of the three, deals with the geography of the table-land, its history and its inhabitants. A capital account is given of the religious beliefs, the manners, and the customs of the people, including a comprehensive glossary of Batak words, both in the Karo and in the Toba dialects, with their Malay and Sanscrit equivalents. In the appendix will be found a census of the population, each tribe being registered with its dependencies, and, approximately, the number of houses in each village. The fauna and flora are briefly dealt with in two short chapters. A *resumé* of the literature on the Bataks is given, and the book is provided with an index; but both require careful revision, as, in their present form, they are by no means complete or trustworthy.

Geography.—The region now inhabited by the independent Batak tribes lies in the interior of the north-westerly half of Sumatra, that is, between 98°–99° 35′ E. long. and 2°–3° 25′ N. lat., covering an area of something like 2320 square miles (6000 square kilometres), with a population estimated at 262,000. The province of Deli lies to the north of this territory, the outlying districts of Atchin hem it in on the west, and other less-known districts under Dutch rule form its eastern and southern boundaries.

The entire territory lies on an elevated plateau, a mean height of 4100 feet (1250 metres) above the sea-level. It is reached by rough tracks, leading over passes in the surrounding mountain ranges, which are of considerable height, some of the most conspicuous peaks attaining an altitude of over 8000 feet. Dense forests clothe their seaward slopes; but their summits, many of which are volcanic cones, are mostly bare.

Portions of the scenery of the plateau resemble the interior of Java, in the numerous isolated hills and smooth volcanic cones that rise abruptly out of the flat country. Chief among these are the extinct craters, Si Ngálang (5900 feet) and Tandok Benúa (5970 feet) —two cones similar as twins—which guard the northern shore of the lake. This character is most pronounced in the extensive Karo Timor plain (north of the lake), the view to the north of which is bounded by mountains, where, in addition to the 7930 feet (2417 metres) high Si Nabun (Spirit Mountain), an imposing almost constantly smoking mountain, there are the following half-dozen striking peaks: Si Bajak, Baros, Liang, Tenaro, Mariah, Si Manuk, and Dolok. Along the boundary of the Pákpak country to the north-west of the lake, the mountains are welded together into one confused range by a number

of ridges and smaller hills; and here also considerable peaks are not wanting, Longsuáten, the loftiest, being 8200 feet (2500 metres) high. It is probably an extinct crater, as the natives tell of a lake upon its summit. Further south the active volcano Pusuk (6580 feet) forms a striking promontory on the north-western shore of the lake; and Von Brenner heard of yet another, Si Nkiring by name, of considerable altitude, further inland to the north. Ranges of hills and mountains, that follow the long axis of the lake, stretch close along its western and part of its eastern shore.

The plateau is well watered: rivers and streams abound, though they are rarely visible from any distance, as, alike in hill or plain, their channels lie in deep cuttings. Three distinct river-systems may be traced, a northerly, an easterly, and a westerly, which, ranged fan-like round the lake, form the head-waters of the many rivers which flow east and west down the mountain-sides, and irrigate the low-lands on their way to the Indian Ocean or to the Straits of Malacca. The Lau Hrnun, lower down known as the Simpang Kiri, is the only navigable river in the Batak Lands. Its course is interrupted by the waterfall of Liang Bangin; but with this exception it is navigable for sampangs (small canoes) from the village of Hrnun, in the south-west corner of the Karo lands, to Singkel, on the west coast, where it joins the sea. The upper course of the Hrnun, which takes its rise not far from the volcano Sinkiring, lies in a deep gorge, the left side of which towers several hundred feet over the right. At five places the rushing stream is crossed by means of a basket slung on a rattan cable, which spans the gorge. This stream, the main artery of the western river-system, is fed by many tributaries. Of one of these, the Lau Binalsa, the natives speak as the "Spirit River," because, "without any apparent cause, its waters rise and assume a blood-red colour, when a human sacrifice alone will pacify it."

But the most striking feature of the tableland is, without doubt, the great sheet of water, known to Europeans by the name of Toba, of which, though only as a name, geographers have been cognizant for more than a century. It lies about 2560 feet (780 metres) above the sea; and, trending from the south-west to the north-east, has a length of about 50 miles (80 kilometres), with an average breadth of 16 miles. It is oblong in shape, and has a considerably indented coast-line. The natives call it by two distinct names, for the central third of its length is so blocked by a large and populous island as to divide it into two basins—a northern and larger one, Tao si Lalahe, or Laut Tawar, and a smaller southern one, Tao Muwara. The island consists of a compact mountain range of gentle contour, attaining its greatest height, 5200 feet (? 2640 feet above the level of the lake), in Deleng si Pira. Of the narrow channels which separate this island from the mainland, Si Gaul, the eastern, is the only one that is navigable at all times, Kota

Raja, the western, being so shallow as to be fordable on foot when the water is low; indeed, during the dry season rice is grown in its bed. The island apparantly owes its name of Toba to Von Brenner, for until his visit it had been thought to be a peninsula, as, unlike the small islands on the lake, of which there are several, it has no native appellation, but is only known by the names of the districts into which, like the shores of the lake, it is divided. The lake has its outflow at the head of the great bay of Balige, in the south basin, in the fine stream Pasir di Babano, which, after a short course, forms a considerable waterfall, and eventually joins the sea at Tandjong Balei. There is, however, no corresponding influx, for no river flows into the lake; and, the insignificant streams and brooks that run their short course down its steep shores are the only visible sources that feed its wide waters—a large expanse indeed considering that, even discounting the space occupied by the great island, the lake's area, as given by Von Brenner, is three times that of the Lake of Constance. The frequent and regular changes in the hue of the lake is a peculiarity worth mentioning. Of a morning, the surface being then mostly unruffled, it appears of a fine dark blue, which changes to a greenish tint along the shores; by noon it is of a leaden grey; and of an afternoon it is whitened with foam by a fierce wind, which here blows with strange regularity. The lake appears to be remarkably poor in fish, and those seen in the hands of the natives were all small, and belonged to two species only. However, the legend which tells of a fisherman who, fishing in the lake, caught a ten-foot fish, and promptly died through fright at sight of such a monster, may indicate that some large species of fish inhabit the deeper water. Lake Toba is not the only lake in the district; but the others are all small, many of them mere mountain tarns.

The geology of the tableland is briefly dealt with. Trachyte (anderite) appears to be the prevailing rock; quartz, shale, and limestone (the latter occasionally very rich in fossils) were also noticed. The soil is loose and porous, composed largely of scoriæ, in which water sinks very rapidly, and to which the deep channels of the streams are attributable. The natives appear to be cognizant of the following metals: gold, silver, copper, tin, lead, and iron; but of these, being ignorant of the art of smelting ore, they are only able to obtain gold, which they wash from the sands in the river-beds. Though far from abundant in this condition, there seems to be reason for believing that gold exists in remunerative quantities in some localities within the confines of the Batak lands.

The fauna and flora of the district cover but a few pages each.

Large game, such as elephants, rhinoceroses, and tigers, are restricted to the wooded and jungle tracts of the Raja and Timor lands, and Von Brenner confirms the observations of previous travellers, as to the paucity of animal and plant life on the actual plateau

land. Deer, wild pigs, and sun-bears find no peace or shelter in the cultivated plains, and are therefore only to be found, and not in large numbers, in the small patches of wood which here crown a few of the mountain summits. Monkeys and apes are confined to the forest regions: those inhabiting the copse which surrounds Purba are the descendants of some pairs that were brought many years ago from Deli, and they are considered as sacred. An interesting fact is the great difference that exists between the animal life of the actual plateau and that of the littoral regions of Toba. According to Dr. Hagen, the fauna of the lake resembles that of the Sumatran coast. Von Brenner himself saw but three species of birds on the lake; namely, the purple heron (*Ardea purpurea*), the familiar moorhen (*Gallinula chloropus*), and the little dabchick (*Podiceps minor*), which last-named bird, by the way, he somewhat rashly describes as a "*kleine Ente.*" He further notes a strange absence of birds of prey. Quails (*Turnix punax*) are frequently met with, and several species of pigeons, the small rice-birds (*Munia*, etc.), larks, and our common sparrow—brought to Deli from Singapore but a few years before his visit—are also mentioned. All the rivers, as well as the lakes, appear to be surprisingly poor in fish —so much so that, during the whole of his wanderings, Von Brenner failed to see a single example in their limpid waters. Reptiles are by no means plentiful, neither do insects abound. Mosquitoes are very scarce, but the vermin which swarm in the native houses quite make up for their absence.

The vegetation of the plateau land is not luxuriant: indeed, it is very poor when compared with that of the coast lands or of the forest regions. This poverty is no doubt due to the centuries during which the land has been under cultivation, as well as to the dry nature of the soil, which, instead of being irrigated, is actually drained by the many rivers and streams of the region, as these almost invariably have their beds in cuttings far below the level of the plain.

The author gives a graphic description of the aspect of the country, of which the following is a brief *resumé*.

In the Karo-Timor districts, the distant landscape of endless green plains, covered solely with plants of low growth, reminds one sometimes of inhospitable steppes, sometimes—and this especially where villages are numerous—of a friendly and even fruitful pasture land. Greater variety of plant life enlivens the copses or the woods which surround the villages; and in the deep cuttings which the streams have dug out for themselves, a good deal of the tropical character crops up in the vegetation. The contrast of the luxuriance of the gorges, however, only helps to emphasize the dull, poverty-stricken look of the plains—the wide stretches of *lalang* adding greatly to this forlorn appearance—and makes one realize how ages of unthoughtful cultivation have impoverished the land. Very different from these Karo-Timor lands must be the yet closed

regions of the Raja and Pak pak tribes, where virgin forest still covers much of the soil. On the other hand, the slopes along the shores of Toba, as well as those of the large island, both under the sway of the Toba tribe, are poor, bare, and sterile—so much so that even from afar the red colour of the island proclaims how bare the soil is of vegetation. But a gladdening sight are the *sawas* (rice-fields), soon after the crop has been cleared off the ground, transformed, as they then are, into veritable flower-beds by the lovely violet-coloured blossoms of the *Monochoria vaginalis*. These great sheets of colour lend a most wonderful charm to the scene, especially where the land, as is so often the case, has been cultivated in terraces. Among flowers that pleasantly reminded him of home, Von Brenner enumerates a violet, a forget-me-not, a ranunculus, and a honeysuckle.

Among a host of trees and shrubs made use of in various ways by the Bataks, the most noteworthy are the *areng*, or sugar-palm (*Arenga sacharifera*), from which wine, vinegar, sugar, syrup, writing-styles, tinder, water-pipes, and fencing and roofing material are derived; the *gambir*, an astringent yellow preparation much esteemed for mixing with the betel and *siri*, but which is also exported to be made up into paint; the citron, of which there are three varieties, is valued for the black varnish (produced by the juice of its burning wood being mixed with its own ashes) that is used to blacken teeth, as also for the preparation of ink; and the bamboo, as already shown, perhaps the most indispensable of all growths to the natives. The benzoë (*Styrax benzoin*) and the camphor both grow to perfection in the lower districts of the Batak lands, the latter attaining at times a height of 200 feet. The produce of these trees constitutes the most valuable articles of Batak trade, and to the former the territory owed its renown among the ancients, who named it "Benzoë Land." Coconut trees are scarce, and of very stunted growth, producing only small nuts.

The author, in summing up the impressions derived from his visit to the highlands, expresses his surprise that so promising a land should have been left in its primitive condition, and this despite the fact that the Dutch, so long ago as 1878, extended their frontier as far as the south shore of the lake. With an excellent climate, one in which Europeans can do a heavy day's work, the region is in every respect suited to the breeding of cattle and horses; and in the tropics, at such an elevation, the growth of many profitable crops (probably including the vine) is a certainty. There is much valuable timber in the still existing forests, and the probable mineral wealth of the country should also be taken into account.* This promising and long-coveted land actually

* That efficient plantation hands could be obtained on the spot—a most important point—the facts mentioned by Von Brenner (p. 352) would seem to prove. He says that in recent years many of the Bataks have left their homes to engage themselves, for a term of years, on the plantations of Deli, and that the number of those who do so is yearly increasing.

remains in the hands of ill-disposed tribes, whose country no European is allowed to enter, and who, within sight of the Dutch outposts, continue their cannibal practices and defy the representatives of the Dutch government. And yet, in the author's estimate, a steamer with two guns and twenty men would in its first cruise make the Dutch the masters of the lake, and a second fort with a small garrison erected on its northern shore would secure the situation. The effect of this extension of the Dutch sphere of action would have far-reaching and salutary consequences; not only would the subjugation of all the independent tribes be certain, and that, probably, with small loss of life, but the long-desired connection between the eastern and western provinces would be established. "This acquired land," he observes, "would form a wedge to separate Achin from those untrustworthy tribes of Sumatra, who, like a keg of powder near unprotected fire, cause a constant danger to the rest and safety of the land; and, further, the christianizing of these districts (protection for the missionaries being then secured) would mitigate the harmful influence of Mahometanism. At the same time, a base of operations against Achin would thereby be created, which, thus being held in check on two sides, would be the more easily subdued." The latter consideration is of no small importance, for the war with Achin has already lasted in a desultory fashion for eighteen years, and has cost the country very dearly, not only in men and money, but, what to the colony is of far more importance, in *prestige* in the eyes of the natives. With these views and hopes of the author, every one who has paid more than a passing visit to the Dutch East Indies will most heartily agree.

PEOPLE.—The name by which these people designate themselves differs somewhat with the dialects spoken by the different tribes, and Batik, Batta, and other forms of the word used by various travellers, may therefore all be correct. The chief clans are five in number: (1) the Karo, inhabiting the plain to the north and north-west of Lake Toba; (2) the Timor, to the north-east of the lake; (3) the Raja, of the country between the latter and (4) the Toba of the eastern and southern shores of the lake and of the large island; and, lastly, (5) the Pak pak, of the densely wooded district to the west of the lake.

The Batak are of Malay stock, forming part of the Indonesian or pre-Malayan branch; in whom, unlike the Malay of the coast, the Mongol element is less marked than the Caucasian.* Von Brenner speaks of considerable differences in the colour of the skin and hair, the latter varying from black to brown, even to red. Neither did he find the features universally Malay, for in the south of the Toba island the type is Aryan, with well-formed noses, often aquiline. Of somewhat small stature, the men are strongly built, and beardless, or almost so; the

* Keane, *Journal Anthropological Institute*, vol. ix. p. 285.

women are not unpleasing in appearance, and, when young, graceful, their fine light coffee-coloured skins giving them a fresh complexion rarely seen in Malays.*

Of diseases, small-pox is by far the most serious, appearing in epidemic form, with such regularity (nine to twelve years) that the people use its recurrence as a measure of time. Leprosy exists, and those afflicted with it are kept apart in special houses. Syphilis, though of recent introduction, has done much mischief. A peculiar skin-disease prevails, and is specially virulent among children; gôitres are common.

Von Brenner describes the men as intelligent, though indolent and fond of gambling. Obstinate, suspicious, and cruel by nature, they yet evince a certain gentleness of feeling, and if once jealousy and suspicion are allayed, their fidelity is secured. Excitable by nature, anger, nevertheless, is rarely if ever shown; in fact, surprise and curiosity are the only emotions not under control. They are superstitious, somewhat shy, and nervous. They dreaded being photographed, as they thought that their "shadow and spirit would be caught and kept prisoner in the little box." Men love their families and homes; women are quiet and modest in presence of men, and are devoted mothers and faithful wives, though as girls they are allowed much liberty and licence. Bataks are talented speakers, and love talk and discussion. They are a civil, ceremonious people, never wilfully giving offence, and in conversation a multitude of courteous titles are used, which vary according to the speaker's rank and position; this holds good also between men and women, and complicated and manifold indeed are the terms of address between relatives.

(To be continued.)

JOURNEYS AND EXPLORATIONS ON THE PILCOMAYO RIVER.

By Lieut. O. J. STORM, late Hydrographer to the Argentine Government, and Professor at the Naval School in Buenos Aires.

THE Pilcomayo is a tributary of the river Paraguay, and rises in the interior of the Bolivian highland, traverses afterwards the immense plains of the Gran Chaco in a south-easterly direction, and falls into the Paraguay river at 25° 21′ S. lat. six miles below Asuncion, the capital of the Republic of Paraguay.

A glance at the map of South America will illustrate the importance of the Pilcomayo as a commercial high-road if it were navigable, and of late this river

* When considering the physical characteristics of the Bataks, future observers would do well to keep in mind two possibly important factors bearing on the question: (1) the periodical commercial visits of the Dyaks mentioned in Von Brenner's journal; and (2) the fact, also mentioned by him, that the Batak country is the usual refuge of Chinese coolies when they run away from the plantations. The majority of these poor fellows are killed and eaten, but a certain number escape and establish themselves among the people.

also claims attention as the boundary-line between the Argentine and Paraguayan Chaco.

Ever since the early days of Paraguay's discovery the Pilcomayo has excited a great interest, and innumerable have the attempts been to explore the river, but as yet no man has navigated it in its whole length, and the part comprised between 20° and 24° S. lat. is still practically unknown, and it is only in the few last years that we have an exact knowledge of the lower course of the Pilcomayo. The cause is partly the natural difficulties which the explorer has to contend with, such as shallowness and rapids, and partly the persistent and violent resistance of the Indians to the "white" man's invasion of their territory.

Space does not allow me here to give a *resumé* of the various endeavours made to explore the Pilcomayo river, and I shall only mention the expedition of Dr. Jules Crevaux of the French navy, which was undertaken at a comparatively recent date (1882), and created much sensation, both in South America and in France, on account of its tragical end. Dr. Crevaux started from Bolivia accompanied by fourteen men embarked in canoes, with the intention to descend the Pilcomayo. In the beginning all went well, and the Indians he met seemed to be of friendly dispositions, but they had already beforehand secretly resolved to kill the obnoxious white intruders. On his arrival at the Indian village Cabayú-repoti, not very far from the place of departure, Dr. Crevaux and his party were suddenly attacked by the savages, and he and all his companions, except a boy, were murdered.

Two years later (1884) the Argentine Government opened a military campaign against the Chaco Indians. Besides the main body that advanced by land under the command of the minister of war, there also were despatched two fluvial expeditions, one by the river Bermejo, and another by the Pilcomayo. The commander of the latter was Captain Feilberg of the Argentine navy, and, besides assisting in the military operations, the object of the expedition was at the same time to make a hydrographic survey of the river, for which purpose I was attached to the party. We penetrated some 300 miles, but were at last forced to retreat on account of low water.

The navigability of the Pilcomayo continued still to be an open question, though our experience from this expedition, as well as that of all others, proved pretty clearly that the river was not navigable for commercial purposes. This I also sustained in a lengthy controversy against the French traveller M. Thouar, who previously (1883) had crossed by land the Gran Chaco from Bolivia to Paraguay in company of a Bolivian expedition, and who ardently advocated the advantage of the Pilcomayo as a high-road to Bolivia. The question was finally submitted to the Institute of Geography in Buenos Aires, which, however, did not arrive at any decisive conclusion.

M. Thouar offered to take a vessel of eighty tons, drawing 2 feet, from Asuncion to Bolivia at any time of the year, while I contended that only under exceptionally favourable circumstances, and with a specially built boat, would it be possible to reach Bolivia by the Pilcomayo. Here the matter remained for several years, till in 1890, through the generous assistance of Mr. A. Busk, I was enabled to show practically the truth of my assertions. This gentleman volunteered to build a small steamer in case I would undertake a new exploration of the Pilcomayo, an offer I at once accepted. The steamer was built by Messrs. Cockrane & Co., and shipped to Buenos Aires in three sections. The *Explorer*, as it was named, was a flat-bottomed stern-wheeler built of galvanized steel, length 46 feet, beam 11½, and draught when loaded only 8 inches. The boiler was placed in the bow, and the engine with a single non-condensing cylinder aft. The speed was very inferior,

specially when burning wood, and did not exceed 5¼ knots. I obtained the necessary permission from the Argentine Government to explore the Pilcomayo river, and the Governor of Formosa [the Argentine territory south of the Pilcomayo] was instructed to assist me to the best of his ability.

The *Explorer* proceeded up the Paraguay river to Asuncion, and here the final preparations for the expedition were completed. It was very difficult to get the natives to accompany me, but by offering double wages I finally succeeded in engaging sixteen Paraguayan "peons"; the Europeans numbered six, making a total force of twenty-two men. My first lieutenant was a Dane, Mr. F. Freund, C.E., a man of great experience in Paraguay, and who was a most valuable companion and assistant during the whole expedition. The late Dr. Thomas Morong of the Smithsonian Institute accompanied the expedition as a botanist. Before I give an account of our expedition, I will shortly explain the hydrographical conditions of the Pilcomayo.

The river has an average width of 30 yards, and its banks are 4 to 5 yards high, covered in some parts with dense forests, while in others the aspect changes into vast plains dotted with palms. There also exist extensive swamps. The depth is very variable, and entirely dependent on the rainfall. The course of the Pilcomayo is extremely tortuous, with very short and sudden bends, making it difficult even for a small steamer like the *Explorer* to wind her way through. The overhanging trees from both sides, and specially the numerous *raigones*,* offer great obstacles and even dangers for the navigation of the Pilcomayo. In some parts the raigones are so abundant that the river-bed at low water looks like a forest of dead trees. We had to stop at every moment to cut our way through, and at times the men scarcely were out of water the whole day. It is all hard-wood, and even the best axes will break. Another serious impediment is the rapids, with very shallow water and strong current. In order to pass these, we had to lighten the vessel and pull her over with warps or even tackles, and some of the men in the water pushing on each side. In some instances we first had to dig a channel in the hard *tosca* before executing this manœuvre. Our principal food was sun-dried beef (*charque*), which in itself is not very palatable, but has the great advantage of weighing little and keeping well. Boiled with beans and some extract of meat, the charque makes a very nutritious dish. We carried very little tinned provisions, to be used only in cases of illness or when unable to light a fire. The rations were distributed every morning by one of the officers, and watch was always kept on the provisions to prevent the men from stealing. We carried a small medicine-chest with written instructions. We were very fortunate with our medical treatment, and though once half the crew were laid up, they eventually recovered, and we all returned in good health.

We only navigated at day-time, and even so we had the greatest difficulties in not running on the raigones hidden under the surface of the water. Military discipline ruled in the expedition; every man had a rifle and twenty rounds of cartridges, and we all slept with our arms beside us. Besides the *Explorer*, we possessed one big canoe, *La India*, and one small, *La Negrita*, which were taken in tow; also a portable canvas boat that was very useful for sporting purposes. In narrow and difficult waters six men were put on board *La India*, punting her against the current at a very good speed.

On January 6, 1890, we left the port of Asuncion, where a crowd of friends and spectators had assembled to see us off, perhaps for ever, as many believed we should never return alive from our hazardous undertaking. At the mouth of the

* *Raigones* is the Spanish word for "snags."

Pilcomayo we shipped the last provisions, and on the morning of the 9th we steamed slowly up the river, which was high and the current scarcely perceptible on account of the flood from the Paraguay river. A couple of days' journey, however, brought us beyond the influence of the Paraguay river, and I was soon convinced that the Pilcomayo itself was very low, though it was just the season for the yearly rise. It took us twelve days of toilsome navigation to reach Las Juntas ("the junction"), a place 120 miles from the mouth, and where the two arms into which the Pilcomayo is supposed to divide itself at about 22° S. lat. again join. There is no doubt as to which of the two arms is the bigger, namely, the western or right one; but the Argentines, from political reasons, maintain that the left branch is the real Pilcomayo. At Las Juntas I encamped in order to overhaul and repair our vessels, which had suffered much during the voyage, and also to give ourselves a well-earned rest. In spite of the exceedingly low state of the river, I resolved to continue the exploration, because I knew from experience that the men would soon get demoralized if we remained idle waiting for a flood to set in.

The next day we recommenced our exploration, following the right branch, but made very little progress on account of the shallowness of the river. Working from sunrise to sunset, with but little rest in the middle of the day, we some days only made a mile and a quarter. The officers set the example, and we passed the greater part of the day in the water, under a scorching sun, removing raigones or hauling the steamer over the rapids. Soon half the crew was on the sick-list, some with fever, and some with dysentery from the bad water.

One evening as we encamped I half despaired of being able to continue the following morning, when a torrential rain set in and kept on during the whole night, causing the river to rise with extraordinary rapidity and force. As the waters covered every mark, I had to calculate the rise, which I estimated at about 10 feet. We loaded the steamer up with wood, and, full of joy and hope, we headed up stream at full speed. The river had changed almost past recognition; all the raigones and rapids had vanished as by magic. What a difference in the navigation from the day before! With the exception of the engineers and the helmsman, the rest of the crew could for once enjoy the *dolce far niente*. That day we made 20 miles, which was the best run against the current we made during the whole expedition. But our happiness was of short duration; a few days later the depth commenced to diminish, and the ghastly raigones once more made their appearance. However, on February 10, after great exertions we reached close to La Espera, 300 miles from the mouth, where we in 1884 had had our encampment, but here it was impossible to advance any more; even *La Negrita*, in which I made a reconnoitring up river, had to be hauled over the "tosca" banks. Very reluctantly I made up my mind to wait patiently for the annual rise, which, according to the hypothesis of the geographers and others conversant with the subject, already ought to have made itself felt; but, alas! this rise never appeared in the six months we stayed on the Pilcomayo. In fact, contrary to all theory, this river has no periodical fall and rise.

Already further down we had seen quite fresh tracks of Indians, and at La Espera we found unmistakable indications of their presence, which, of course, increased our vigilance; we made several attempts to find their wigwams, but without success. We now made preparations for a prolonged stay, pitched our tents and disembarked all our provisions and implements. We also constructed a ranch for the officers on a long sandbank in the middle of the river-bed, where we were less exposed to the troublesome insects and the heat than on board the *Explorer*.

I had all the stores weighed, and found that our provisions would last for sixty

days. The distance to the nearest Bolivian village I presumed to be 500 miles, which we with high river ought to cover in thirty days; besides, I trusted to be able to buy provision from the Indians further up. Taking everything into consideration, I calculated that we could afford to wait a month for the river to rise. Day after day, however, passed without the slightest change, except that the river always fell, the provisions diminished, and the mosquitoes augmented. We beguiled the time as best we could, specially by shooting, but gradually the game became scarcer, and we had to look for it at considerable distances from the encampment, which was not without danger on account of the vicinity of the Indians. Fortunately, we had a good stock of books, and our botanist's piles of old *New York Heralds*, which he used for drying his plants, were devoured with avidity. We also played at chess and at other games, had target-shooting with prizes, etc.

The heat, specially at night, was very oppressive, but not to be compared with the annoyance we suffered from the swarms of insects which harassed us day and night. Wind and sun were the only things which would moderate their attacks, and we therefore used to promenade in the broiling hot sun, fanning ourselves with kerchiefs in order to keep our enemies away. I shall not try to make a scientific description of our tormentors; it suffices to say that we discovered six different classes of mosquitoes of various sizes and colour, some even walked with their feet in the air. There were also many reptiles, of which the rattlesnake was the most objectionable, besides the tarantula and the big bird-spider.

After a stay of three weeks in Las Penas ("the sufferings"), as we significantly named our encampment, there was still no sign of an approaching flood, and I realized that we should have to send for some provisions in order not to abandon the exploration and the steamer. After consulting with Mr. Freund, we agreed that he should take *La India* and six men with provisions for fourteen days, and go down to Asuncion to fetch a new crew and fresh stores. We picked out the most useless among the peons to go in the relief expedition.

On March 3, we bade Mr. Freund and his comrades good-bye with a heavy heart, as it was doubtful whether we should ever meet again. They had before them a journey of 300 miles and back by a dried-up river, and we on our side, twelve men all told, of whom seven were rebellious half-castes, were left with scanty provisions, and practically cut off from retreat should we be attacked by the Indians, the river having fallen so much that the *Explorer* could not float. I calculated that Mr. Freund should be able to get back in five weeks' time—that is to say, about April 10—while our provisions, by exercising great economy, should last a week over this term. In case the river should rise, I had agreed with Mr. Freund to go down in the *Explorer* and meet him at Las Juntas.

The days now commenced to drag on with a maddening slowness. We never went about alone for fear of Indians, nor did we absent ourselves for great distances from the encampment. Almost every day the sky looked threatening, but invariably it cleared up without the rainfall for which we so anxiously longed. We used to get our drinking-water from a neighbouring pool, but it gradually dried up, and we were then obliged to fetch the water every morning from a small brook 6 miles up the river. The provisions also diminished with an alarming rapidity, and at the end of the month our stores of flour, peas, and beans were finished, only the tough "charque" remaining, which we prepared together with palm-cabbage. We also shot an alligator, the only one that had remained after the drought set in; by cutting off the tail, and boiling it before roasting, we got a very eatable dish of fresh meat, in spite of the repugnance which these reptiles impress on the mind. Under these circumstances the time for the return of Mr. Freund expired. The river was still exceedingly low, and this might count for his

tardiness, though I in my calculations had made good allowances for it, and I therefore feared he had been attacked by the Indians on his voyage down or up.

On April 14 we had provisions left for only one day more, and I was now forced to leave the steamer and go down the river in search of our companions and of food. All the superfluous arms and implements were buried in the bank, and the ammunition together with $200 in silver enclosed in the boiler. The chronometers and astronomical instruments I carried along with me in a box on board the *La Negrita*, manned by four men; one man embarked in the canvas boat, and two in a canoe which we ourselves had scooped out of the trunk of a tree; the rest, four men, had to walk on foot along the bank. The Pilcomayo was so low that we, at every instant, had to jump out of the canoes and drag them along the dry river-bed. Each man was only allowed to take one set of clothes, his rifle, and a "poncho." The weather was hot in the day-time and cool at night, and one evening we were surprised by a heavy hailstorm. As soon as we got some miles below Las Penas we found abundance of game, mostly birds; but as we by this time were short of cartridges, we had to be very careful when shooting. I had arranged with Mr. Freund that he, at certain places, should leave news of his voyage, and, in fact, at La Mora Negra I found in a bottle a slip of paper announcing his safe arrival at that place on his way down. This message was a great relief to me and all of us. After a couple of days, the men on foot suffered from sore feet and swollen limbs, and were unable to proceed any further. We tried to build some rafts of dried palms, in which they made but slow progress, running into raigones at every instant.

In the afternoon of the fifth day, just as we turned a bend of the river, we suddenly came on Mr. Freund and his party, drawn up in a line, and ready to receive us with a shower of bullets; they had heard some shots, and believed that the Indians had killed us and had seized our arms. For all that, our appearance was far from reassuring, and we looked more like savages than white men in our scanty and torn clothes. The joy at meeting each other is not to be described; only the old peons, who had been with me, were very crestfallen, as they had hoped to reach Asuncion and be paid off. Half imploring and half threatening, they asked permission to continue the voyage down stream by themselves. I immediately had all the peons drawn up, and told them briefly that I had not the slightest idea of giving up the expedition, nor allowing anybody to abandon it, and whoever should try to do so would do it at the risk of his life. This had an excellent effect, not only on the old peons, but also on the new ones that Mr. Freund brought, and who had behaved rather independently. Mr. Freund was accompanied by a friend, Mr. Noble, and eight peons. Besides the old canoe, *La India*, he also brought a new one, both loaded with provisions.

The cause of the delay was simply the exceedingly low state of the river. The same day that we met, a rise had set in owing to some rain, and in high spirits we again started up river to return to the *Explorer*, which we reached on April 24, after an absence of ten days. The previous days we had seen big prairie fires, which indicated the presence of Indians; but, fortunately, we found the steamer and everything on board her just as we left them.

The total rise of the river at Las Penas was 14 inches. The arms and implements were again unearthed, and on the following day the whole expedition, headed by the *Explorer*, proceeded up stream. We passed the river Dorado, a tributary of the Pilcomayo, and reached the rapids which had stopped our expedition in 1884, and, though the waters were now much lower, we succeeded in passing them after having cut a channel. As we advanced the presence of the Indians got more marked. In the night we saw their watch-fires and heard their war-whoops; we also

came on several abandoned wigwams. Twelve miles above these rapids we found a waterfall 5 feet high. After having examined the ground, I resolved to excavate a slip in the left bank; placed four palm-trees longitudinally, 3 feet apart, the whole length of the sloping terrace, and short rollers, also of palm-trees, on the top of these. On the fourth day after we commenced the work, we gave the first pull with the tackles fastened to the bow of the *Explorer*, and, to our great satisfaction, she gradually ascended the slip, and the next day we were able to launch her above the fall, which we baptized "Salto Palmares," from the immense forest of palms which exist there. Thus we had overcome this obstacle, but a still more serious one was in store for us. A couple of miles farther up, the Pilcomayo converted itself into a big swamp all covered with rush, and extending as far as the eye could reach. In the small canoe I penetrated about a mile into the swamp, and ascertained that, unless there was open water farther up, it would be impossible to penetrate with the *Explorer*. Naturally enough the men were rather disheartened, and the night before we were to enter the swamp two of the peons disappeared. This time they had not been able to steal any of the canoes, but had left on foot. Accompanied by a couple of men, I set off in pursuit of them, but was unable to track them in the dense forest. I knew, however, that they had but a poor chance of finding their way back to civilization alive. About their fate I shall relate later on.

As soon as we entered the swamp the engine was of no use any more, and we could only advance by warps and punting. After great efforts we penetrated into a sort of small lake with comparatively open water, and here I determined to leave the steamer and explore the whole swamp in canoes. On May 16 I started, accompanied by Mr. Freund and eight men in *La India* and *La Negrita*, provided with food for thirty days, and 150 rounds of ammunition per head. The steamer I left in charge of Mr. Noble, to whom I gave written instructions how to proceed in the different cases that might present themselves. In case of a rise, he was to follow us up; while if the river should fall, he should return to Salto Palmares, and there wait our return till he had only provisions left for fifteen days, and then save himself and leave us to our fate.

The Pilcomayo seemed at first to disappear in the swamp; this, however, was not quite the case. The river wound its way through the morass, and was conspicuous by the height of the grass and abundance of aquatic plants with which it was filled. In some places this "green" river had spots of open water with a depth of about 6 feet, and an almost imperceptible current. The average width of the swamp was 5 miles. We first tried to follow the river, but soon found that it was easier going through the swamp itself, where the grass was not quite so dense, and was covered with about 10 inches of water. Partly pushing and partly punting, we advanced close upon 2 miles before darkness came on. Of course there was no *terra firma* where to encamp, and we had to turn in all standing in our canoes. The nights at this time of the year were quite fresh, and the thermometer would be as low as 42° Fahr. We forced our way through the swamp for three days, and still the condition of the river did not improve; but in the morning of the fourth day it gradually changed into an open stream, where we made good progress with the poles, expecting soon to get out of the dreary morass. However, a mile and a half further up the river again closed in, and divided itself into three branches, which each gradually disappeared in the swamp. This was now so overgrown and shallow that even our small canoe could make no headway. We successively tried the different arms, all with the same result—impassable! It was evidently of no use to continue any more in the canoes, but at the same time I did not like to come back with the intelligence that the Pilcomayo disappeared, without knowing how or where. I determined to leave the boats in charge of a few men, and undertake an exploration by land. After

wading through water and mud for an hour and a half, we once more trod firm ground, and directed our steps northward, following an Indian footpath which led us to an encampment, where we found plantations of pumpkins and Indian corn.

We saw quite fresh prints of horse-hoofs, and it was plain enough that the Indians were about. A little later we also discovered two of their scouts in a tree; we made some friendly demonstrations, but the savages soon disappeared. Even if our number should have permitted us to engage in a fight with the Indians, I should have tried to avoid it as long as possible, and my policy was always to establish a friendly intercourse with the Indians, in order to get some information from them regarding the Pilcomayo; but during the whole expedition we never were able to get near them. They evidently believed us to be the van of a military expedition, similar to the one which in 1884 had punished them so severely.

About 12 miles from our starting-point we again found the Pilcomayo, which here presented a similar aspect as below the morass. We followed its course in the direction of the current, in order to make sure that it was the real Pilcomayo, and soon sighted the swamp, which made a big bend to the south-west.

We had now achieved the object of our land-exploration, and returned to our canoes, in which we once more made an attempt to penetrate in the direction where we had refound the Pilcomayo, but in vain. The swamp was almost dry, and quite impenetrable, and we might just as well, or easier, have hauled our canoes over land; but this would be an operation that required more time than our stock of provisions would allow us, if we were to continue the exploration above the swamp. Moreover, the waters had been falling ever since we left the *Explorer*, and for this reason alone I should have to beat a hasty retreat. So on May 29 we started on our return voyage to the steamer, which we reached three days later at Salto Palmares. Mr. Noble and his party were all safe, and had commenced preparations for repassing the fall. These we completed, and soon got the *Explorer* over.

The river by this time had fallen 24 inches since we first arrived at Salto Palmares, and was still falling at the rate of 3 inches every 24 hours, and I feel assured that, had we been a few days later, I should have had to leave the steamer behind. As it was, the bottom of the *Explorer* grated the tosca-banks as we shot the rapids, driven by both engine and current. However, the raigones, as always, proved to be the most dangerous obstacles; and, after having run into one, we got the bow knocked in, and had to run the steamer ashore in order not to sink. A slip was soon constructed, the forepart was beached, and the damage repaired.

Passing the Dorado river, we, strange to say, found it swollen, and consequently, from this point downwards, the Pilcomayo was comparatively high and the navigation easy. A few days later we approached the place where we had met Mr. Freund and his relief-expedition, when suddenly a human being of a wild and ghastly appearance rushed out of the woods, and, falling on his knees, implored to be taken on board. It was Julian, one of the deserters at Salto Palmares. At first I thought of leaving him to his fate, as he had left us; but when he, all in tears, told me that his comrade Antonio was dying in the bushes, I took pity on them, and had them brought on board. Antonio, who formerly was an active and powerfully built man, was so exhausted that he had to be carried on board, and could hardly speak. Julian, though not actually ill, looked like a skeleton. On being interrogated, he explained in "guarani" (Indian) *patois* that their original plan was to pick up the canvas boat which I had had sunk below the fall as useless, but our keen pursuit had frustrated this design. They continued for a while on foot, following the banks of the river; tired of this, they constructed a raft, which, however, capsized, and Antonio, already then ill, was nearly drowned, and their rifles and few

provisions lost. They again started walking, but Antonio, getting worse and worse, finally could not move any more, and had been lying down for four days at the place where we overtook them, waiting for death to relieve him from his sufferings. They had been able to sustain life by some stray birds.

Without further incidents, we reached Las Juntas, where we found the other branch to be very low. Mr. Freund, on his relief expedition, had met with another exploration party, under the command of Captain Page, of the *Argentine*, who had penetrated into the left arm of the Pilcomayo, and from the low state of this river, I presumed that Captain Page might have been caught in the same way as we had been ourselves at Las Penas, especially as his steamer was considerably larger than the *Explorer*.* I therefore resolved to go in search of Captain Page, and to offer my assistance, if necessary. However, after penetrating a few miles, I found the river so low that I had to abandon all hopes of advancing any further. Consequently, we returned to Las Juntas, and continued our downward journey.

Four days later we reached the first settlement close to the mouth of the Pilcomayo, where I was told that three days previously a canoe, with five men belonging to the Page expedition, had passed on their way down in search of provisions. On June 17 we once more dropped anchor in the port of Asuncion, after an absence of 162 days.

We had not been able to reach Bolivia, but I had practically proved my theory, that the Pilcomayo was not navigable. We had penetrated further than any other expedition; had surveyed the course of the river towards 24° S. lat. and had made a series of astronomical and meteorological observations. Among the collections, the botanical was specially rich, containing a number of formerly unknown plants.

On my return to Buenos Aires, I presented to the Minister of War an account of the expedition, accompanied by a map of the river and a report on its hydrological conditions. I will not here enter into the details of my report, but only mention the conclusions I arrived at after a careful investigation into previous explorations of the Pilcomayo, and comparing these with the experience and observations gathered in my own.

1. The Pilcomayo is not navigable for commercial purposes.
2. The western or right branch is the principal river of the two that join at Las Juntas.
3. The Pilcomayo has no regular and periodical rise or fall.
4. It is probable that the Pilcomayo debouches into the Paraguay river by one or more outlets beside the one in front of Lambaré below Asuncion.

THE MONTHLY RECORD.

THE SOCIETY.

Honour to the President.—M. Arthur Claparède, President of the Geographical Society of Geneva, writing to Mr. Markham, informs him that he has been elected an Honorary Member of that Society in place of the late Sir Henry Rawlinson. The number of such members is limited to

* The Page expedition actually was detained some 30 miles above Las Juntas, and did not get back till May, 1891, after an absence of fourteen months, and with the loss of its commander, the doctor, and several men. During the whole of this time the left branch of the Pilcomayo never had a rise of any importance or duration.

thirty. "The Society," M. Claparède, who writes in English, states, "is very pleased to be able to place among its Honorary Members a man who, by his illustrious travels and books, is so well known to the scientific world and to geographers, and who so ably presided over the Sixth International Geographical Congress, held in London last summer."

Educational Lectures.—The second series of ten lectures on "The Principles of Geography," by Mr. H. J. Mackinder, M.A., will begin at Gresham College, Basinghall Street, on Monday, January 13, at 6 p.m., and be continued on succeeding Mondays. The subjects of the lectures will be as follows:—Lecture 11, the Relief of South-East Britain; 12, the Structure of South-East Britain; 13, the Drainage of South-East Britain; 14, South-East Britain before Cultivation; 15, the Successive Entries of Man to South-East Britain—Natural Frontiers; 16, the Metropolis; 17, Roads and Minor Settlements; 18, Territorial Organization; 19, the Part of London in British History; 20, the Part of Britain in the World's History. Each lecture will be followed by a class for more detailed study, and the course will be illustrated with diagrams.

EUROPE.

"University Extension" in Austria: Geography.—Among the "Popular University Courses" which are being held this winter for the first time under the direction of professors, lecturers, and assistants, in the University of Vienna, both geography and its sister science geology are represented. Dr. R. Sieger is dealing with the "Elements of Geography" in a course of six lectures, which were opened by Professor A. Penck in a discourse on the "Beauty of the Earth." A second course of six lectures on "General Geology" is being delivered by Dr. F. Wähner. Lantern illustrations are employed to give additional point to the descriptions of the lecturers, and to render them more generally intelligible. These courses are open to all, with the sole exception of school-children.* In Prague, too, there will be "Popular Courses" during the winter, under the direction of the Professors of the German university in that city, among which one by Dr. Uhlig on "Geology" is included.

The Military Geographical Institute in Vienna.—We learn that Major-General (commanding division) Emil Ritter von Arbter, director of the above institute since November, 1889, has been placed on the retired list at his own request, with special honours. Major-General Christian Ritter von Steeb, formerly Surveyor-General, has been appointed to the vacant directorship.

ASIA.

The Pamir Boundary Commission.—From a brief official report by Colonel Holdich, dated Bandipur, October 12 last, supplemented by an admirable series of letters to the *Pioneer* written by one of the members of the Commission, we glean many noteworthy particulars of the route and geographical work accomplished. The road followed was by way of the Burzil and Darkot passes, the latter of which proved most trying to the native followers, who were blinded and blistered by the burning July sun reflected off the dazzling newly fallen snow. This was the most arduous bit of the journey, the crossing of the Hindu Kush itself being not over the Baroghil, but by a pass "equally easy" a few miles east

* The charge for each course, extending over six evenings, is 50 kreuzer.

of it. From Sarhad to the Pamirs, the track along the Wakhan river was excessively narrow and steep, but was readily traversed by the Kashmir ponies, which proved a decided success as beasts of burden. Here the survey party under Colonels Holdich and Wahab had to fall behind, owing to the rapidity of the march. The long narrow valleys, flanked by ranges resting on bases so broad as to render the peaks invisible from the plains, were excessively difficult to map out, a state of things aggravated by bad weather. From the summit of a grand peak overlooking the Benderski pass, however, Colonel Wahab was enabled later on, during a momentary break in the weather, to fix a complete array of Himalayan peaks to the southward, which contributed effectually towards the satisfactory union of the two systems of triangulation. The main geographical objects of the surveyors were to make a topographical map of the country adjoining the boundary, and to join the two systems of triangulation as mentioned. In the previous Afghan Boundary Commission all difficulty as to a common basis of triangulation had been obviated by the acceptance on the part of the Russian Commissioner of the results obtained beforehand by the British party. In the present instance, the Russian triangulation, which is of first-class rank among geodetic surveys, had already been extended as far as Osh, about 200 miles from Lake Victoria, while on the Indian side triangulation by Colonel Tanner had been projected so as to fix several peaks south of the Hindu Kush and Mustagh ranges. Bases were accordingly measured at Zartigar, north of the Baroghil pass, at Langar Sarhad, and at Chakmaktin, on the borders of the lake which is the source of the Aksu, at an elevation of 13,000 feet above sea-level. In spite of cloudy and squally weather, Colonel Holdich tells us that the connection between the bases was maintained, and plane-tabling was carried on with praiseworthy determination by Khan Sahib Abdul Ghazar. At the first *séance* between the English and Russian surveyors, it was decided to select two points for a final comparison of co-ordinate value (*i.e.* in latitude and longitude, as also in altitude), and these were arranged to be No. 1 Pillar of the Boundary Demarcation at the eastern end of Lake Victoria and the Gumbaz or dome of Kizil Robat, near where the demarcation ends. At the former the greatest difference in the latitude observations occurred, the Russian value being 37° 26′ 10″, and the English, by triangulation, 37° 26′ 30″, or 20″—a difference which Colonel Holdich was unable to account for. At Kizil Robat Gumbaz the difference was only 10″. But as regards longitude the agreement was remarkable, the difference in regard to Pillar 1 being only 4″, and Kizil Robat Gumbaz 6″. Thus, as Colonel Holdich says, "We found ourselves standing on the roof of the world, with practically no differences between us to eliminate and disperse so far as our mapping was concerned." * About forty well-marked points and peaks were fixed by triangulation, which will form an admirable series for a final trigonometrical junction with the Russian system, while about 4800 square miles of topography were sketched on the quarter-inch scale, besides 250 square miles of special survey to illustrate doubtful or disputed points. Unfortunately, Colonel Wahab was unable to obtain a second determination of the great peaks on the Trans-Alai range and the well-known Tagharma mountain, which would have formed a valuable connection with route surveys in Eastern Turkistan; while Colonel Holdich was prevented by Chinese obstructiveness from determining the position of Tashkurgan. Lastly, as regards height observation,

* The values were as follows:—

Pillar No. 1 { English ... 73° 48′ 55″ / Russian ... 73° 48′ 59″ } = + 4.

Kizil Robat Gumbaz { English ... 74° 46′ 56″ / Russian ... 74° 47′ 2″ } = + 6.

the trigonometrically determined altitude of Kizil Robat (12,780 feet) was in absolute agreement with the Russian value, while that at Lake Victoria (13,300 feet) only differed by 40 feet. Altogether, the geographical results of this Commission may be pronounced to be of the highest importance, and to reflect no small credit on Colonels Holdich and Wahab and their native assistants, while the extraordinary rapidity of the operations, which were compressed into an aggregate period of four months (two of which were spent in travelling), is an additional point of congratulation, for had luck failed to befriend them in this respect, it would have been impossible to achieve the desired results, political and scientific, within the short working season available in these semi-Arctic regions.

Expedition on the Indian North-East Frontier.—Owing to the hostility of the Sana Kachins, who inhabit the hilly country about the headwaters of the Irrawaddy, between 26° and 27° N. lat., the Indian Government have decided to despatch a small expedition, consisting of about 450 mounted police and two guns, into the Sana country, to inflict chastisement on the Kachins, and exact guarantees for future good behaviour. From a geographical point of view, the move will be very interesting, as it will doubtless throw additional light on the sources of the Irrawaddy, which are still unknown. Our extreme post in that direction is Myitkhina, and, owing to the difficulty of the country, the deficiency of supplies, and the refractory character of the mountaineers, it has been found impracticable to penetrate much more than 50 miles north of that station, and to make a thorough examination of the two main head-streams, into which the Irrawaddy divides about 25° N. lat. Indeed, there has been no practical advance beyond the geographical standpoint attained by Colonel Sandeman's native explorer in 1879. The Sana section of the Kachins inhabit the tract lying between the Mali-Kha, or western river, and the hills separating its valley from that of the Hukong, which lies nearer to the Assam frontier. It is intended that a survey party with an escort shall reconnoitre the passes across this intervening range, with the object of opening up the Hukong valley, which is fertile and productive of the *Ficus elastica*, or rubber tree. With the development of these regions, it might become feasible then to carry into effect the long-deferred and much-needed connection between the Assam railway at Makum and the Burmese system at Mogaung, and thus join the basins of the Brahmaputra and Irrawaddy. From Mogaung to Myitkhina the line has been already sanctioned, and, in spite of the difficulty of the intervening region to the north-east, it is anticipated that much of the Yunan trade will be attracted by this route.

Prince Henry of Orleans in Indo-China.—A letter from Prince Henry of Orleans, dated Tali-fu, June 1, 1895, has been received by the Paris Geographical Society (*Bulletin*, 1895, p. 388), in which the traveller gives an account of the successful completion of the first stage of his new journey, viz. that from Tonkin to Yunnan. The object of the prince was as far as possible to avoid the main routes, and travel by paths hitherto untraversed by Europeans, and in this he seems to have succeeded to a large extent. Accompanied by MM. Roux and Briffaud, and with twenty-seven baggage animals, he set out from Manhao, on the upper Song-ka, on March 1, and explored the country on the right or southern bank of that stream, having heard of a mule-path to Yuen-chiang in that direction. The country passed through was very rough, involving constant ascents and descents of steep slopes by slippery paths. Before reaching Yuen-chiang (which town was passed both by Garnier and Colquhoun), the prince struck south-westwards in order to reach Ssemao by a new route, which was reported to be used by the tea-caravans coming *viâ* Muong-li. The population was for the most part non-Chinese, consisting of Hu-Niis, Taos, Lolos, and Païs, who generally accorded the party a peaceful reception,

although at one village, whose people mistook them for brigands, hostilities were for a time threatened. The country was as broken as that near the Song-ka, and the route led across the Li-san-Kiang or black river, as well as an important tributary. The Mekong watershed was crossed at an elevation of 4300 feet by an easy pass, before the great plain of Ssemao was reached. Two Englishmen were reported to have lately passed through the town, having come from Burma to Tali-fu by Teng-Yueh, and returned by Yun-chu and Ssemao. From the latter town Prince Henry proceeded westward to the Mekong at Nocha-Tiampi, the second crossing-place northwards of Khieng-hung. A colony of Païs exactly resembling the Laotians, surrounded by populations who have adopted the Chinese dress and customs, was passed *en route*. From Tiampi, where the river had a breadth of 120 to 160 yards, with wooded banks of moderate steepness, the expedition turned northwards, keeping for the most part within the valley of the Mekong, though at one point the crest of the ridge separating it from the Salwin was crossed. In this latitude the basin of the Mekong seems to have a very small width, the whole of which can be crossed in eight hours. The whole route was through a mountainous country. Altogether the river was touched at six different points, the observations taken at which will supply the basis for the mapping of this little-known part of its course. The representations of previous travellers as to the unhealthiness and dangerous character of this portion of the valley seem not borne out, a frequented route leading along it from south to north, from the Laos country to Tali-fu. The latter place was reached on May 26, the Mekong having been finally crossed by a chain bridge near Shunning-fu, north of Yun-chu. Besides the topographical survey, investigations were made into the natural history, commerce, and ethnology of the regions traversed, and twenty-two Lolo manuscripts were obtained, two being in part translated into Chinese. The following telegram has been received from Prince Henry: "At the end of August we completed the exploration of the Chinese Mekong. From September to December we have gone on foot through the independent country of Tibet, crossing all the branches of the Irawadi near its source, and have arrived in Assam. Since our departure from Tongking we have travelled 2000 miles, 1500 having been previously untrodden. We have made numerous collections, and hope to arrive in France in the middle of February."

The Tibet Expedition of Captain Roborovsky.—The following telegram, dated Zaisan, December 4, has been received by the Russian Geographica Society from Captain Roborovsky, chief of the Tibet expedition, announcing his return to Russia: "On December 3 the expedition reached Zaisan. Kozloff went from Lyukchun, *viâ* Girchen and Jungaria, to Urungu and Zaisan. I came with our caravan, heavily laden with collections, *via* Urumchi and Mienas, through waterless Jungaria, on a new route to Kabuk-Zaisan. All in good health. The expedition has covered altogether over 16,000 versts (10,700 miles), and made a survey all along. Thirty points have been determined by astronomical observations; meteorological observations and hypsometrical measurements made all the time; fauna and flora explored; many photographs. The natural history collection contains 250 mammals, 30 skins of mammals, 1300 skeletons of birds, 450 amphibia and fishes, 30,000 insects; herbarium contains 25,000 specimens of about 1300 species, 300 specimens of wild and cultured seeds; 350 geological specimens. A great variety of ethnographical, military, and other observations. The meteorological station at Lyukchun has been at work for two years. As soon as the expedition is broken up, we come to St. Petersburg."

Expeditions in Siberia.—We learn from *Petermanns Mitteilungen* (1895, No. 8) that an expedition under the command of Lieut.-General Petroff has been

set on foot, for the purpose, in the first instance, of furthering the progress of the Siberian railway, but with the additional object of studying the question of the general opening up of the country through which it passes. Its attention will be directed to the waterways, and the possibility of opening them to navigation, and also to the mineral resources and supplies of wood, particularly in connection with the fuel requirements of the railway. M. Obrucheff has also been entrusted with a commission to explore the mineral wealth of Transbaikalia, particularly the district of the river Onon.

New Attempt to reach Lhasa.—It is stated that an attempt to reach Lhasa is being made by Dr. P. Moewis, who with this object has professed his conversion to Buddhism, and adopted the habit of a lama at Darjiling (*Pet. Mitt.*, 1895, No. 8).

AFRICA.

Miss Kingsley's Travels in West Africa.—Miss Kingsley has kindly sent, at short notice, the following notes on her recent journeys in West Africa: "I was in Calabar from January until the end of April, 1895, owing to the kindness of Sir Claude Macdonald and Lady Macdonald. I was able to do some work among the fishes and insects there, and obtained an addition to the knowledge of my favourite subject, fetish, that is of immense use to me. My aim in going out this time was to get together a general collection of fish from a West African river north of the Congo; for the terrific current of that river, I found on my previous journey in 1893, makes a tremendous impression on distribution. I also found that an equally interesting difference in the species of religion existed between Calabar and Cameroons, where you cross the border-line between the true negro and the Bantu races; so I, on leaving Calabar, went down to Congo Française, where I knew, from previous experience in Kacongo, that the influence of my friend Mr. C. G. Hudson would be of great service to me. It was; and I started fishing in the Ogowe, pottering up that beautiful river to above the Alemba rapid. I then made my way down the Rembo Ungo into the Karkola river, from thence into Lake N'Kovi, and then overland through Efuma, Ejaga, and Esun, etc., and came out on the Rembwe at N'dorko, making my way up to Agonjo. From Agonjo I came down the estuary of the Rembwe and Komo to Glass, where, knowing my wandering through the country of the Fans would not be approved of, I endeavoured to persuade Mr. Hudson that I had done so from scientific motives. 'No, Miss Kingsley,' he said; 'you fell into the hands of those wretched Fans, and they took you touring about their country like a circus show,' etc. I am bound to say there is much truth in his statement. At the end of September, in the tornado season, I reached Victoria per s.s. *Niger*, owing to the kindness of the Governor of Cameroons, Herr von Puttkamer, and of the Vice-Governor, Herr von Luke. I was enabled to get more fetish information, and ascend Munyo ma Lobe; and when I had done these things, as Julius Cæsar would say, they sent me round in His Imperial Majesty's ship *Nachtigal* to Calabar, and from Calabar I came home in one of my old friends the British and African Company's steamboats. The Ogowe, which is pre-eminently the river of the equator, is more of the nature of the Congo than of the Niger Delta rivers, save that, unlike the Congo, it has an immense delta. This delta commences at Lambarene, 130 miles from the sea, and just below the entrance of the Nguni. This delta region is tremendously interesting, both in its flora, fauna, and fetish. It is called Kama country. Its main population is made up of malaria microbes and mosquitoes, and it is supremely damp; indeed, the whole of it, save the strange bubble-shaped hills you find in it, is under water from Lambarene to the sea, where the Ogowe comes down in the 'long wet'—the

two great lakes in the Lambarene district, Lake Azingo, and the larger Lake of Islands, and all the string of lakes along the Rembo Ungo, overflowing into the forest. I hope to embody my knowledge of this region, chiefly a knowledge of the north side of the delta, in a chart. I will now only say that the long slope of the land between the Ogowe and the Rembwe is towards the Ogowe and Lake Azingo, the short slope is towards the Rembwe, where the spur hills of the Sierra del Crystal range end suddenly in mangrove swamps. The mangrove line is far higher up on the Rembwe side than up the Ogowe, because the broad estuary of the Gabun, into which the Rembwe and the Komo fall, brings the salt tide water further inland, and because the current of the Ogowe is, like that of the lower Congo, exceedingly swift and strong, and the body of fresh water poured out by it immensely larger than the conjoint supply emptied by the Rembwe and Komo into the Gabun. There is one point that puzzled me about the Ogowe, which no doubt learned people can easily explain, and that is, that this river commences to rise, in the 250 miles of the river that I know, a month before the rains begin. The rise of the Ogowe in the long wet is 18 to 20 feet in Talagouga narrows; in the short wet it is from 12 to 15 feet. In regard to the peak of Cameroons, I should like to say I was the twenty-eighth European who succeeded in ascending it; the second to ascend it from the south-east face, the usual route being by the sea face from Babundi. My motive in taking the other way was to get a view of the Rumbi and Omon mountains, a range—for they are, geographically speaking, one and the same—totally distinct from the great Cameroons, whose relations are Clarence peak, Fernando Po, St. Thome, and Anno Bom,—mushrooms, as regards age, to the Rumbi and Sierra del Crystal. The first party to ascend the peak of Cameroons from the south-east side was the first lieutenant and the doctor of His Imperial Majesty's ship *Hyæna*, and I owe much to the information they gave me when I had the honour of meeting them at Victoria. I wish to acknowledge in this far-reaching *Journal* my deep sense of indebtedness to the French and German officials; and when I think of the magnificent opportunities afforded me, both in Congo Française and Cameroons, and the safety that their practical help and prestige enabled me to enjoy, I am ashamed at not having done more in matters that would interest geographers, but I am only a lady pottering about after fetish and fishes. The administration of Congo Française filled me with admiration. France is singularly fortunate in having for governor of this colony the greatest of the West African explorers, M. de Brazza; but he is most splendidly seconded by his subordinates, who 'go for bush' with a hand-valise in a way, I grieve to say, the English on the coast do not. Indeed, were it not for the Royal Niger Company, who have done, and are doing, a magnificent work, of which every Englishman should be proud, our position, as regards exploration, etc., on the coast, would be a very despicable one; for where, outside the Niger Company, can you find men worthy to be named in the same breath with De Brazza and Dr. Zintgraff? The present trade value of our west coast possessions to us is over £3,500,000 a year. It will not be that long if we do not possess ourselves of the command of the interior trade routes. The whole of the Niger delta coast is structurally incapable of being self-supporting, and we shall some day, if we persist in 'living for beach,' find ourselves cut off from the interior trade supply all along the line. Sierra Leone is already ruined. Our chance is still open to us behind the Gold Coast, in the Niger delta, but it will not stay open long."

Dr. Gruner's Expedition in the Niger Basin.—A fuller account of Dr. Gruner's expedition than that previously published (*Journal*, vol. vi. p. 184) has been communicated to us by Dr. von Danckelman. Misahöhe, of which station Dr. Gruner had for two years been chief, having been left on November 5,

1894, Salaga was reached on December 2. A civil war, consequent on the death of the last sultan, had laid waste the whole country round; and the town itself had been reduced to a village of scarcely a hundred huts. The Dagomba territory, of which Yendi is the capital, is fairly well peopled, has large farms, and is rich in cattle. It is ruled despotically by a sultan, who has acquired a considerable influence in these regions. Sansanne Mangu, further to the north-east, is of less importance, though governed in the same way. The route hence led by way of Pama, Machakuale, and Kankanchari, then the residence of the king of Gurma. Lieut. von Carnap had been sent on here in advance; but the whole expedition again united and set out for Say on the Niger, traversing a completely waste and desolate region. The river, although low at the time, has an average breadth at that place of 900 yards. At Kirotashi Dr. Döring, who had remained behind at Boti, again joined the expedition on February 22, having proceeded thither by land. Whilst the main body now journeyed down the stream on the right bank, Dr. Gruner proceeded in a canoe, in order to take an accurate geographical survey of the stream. At Bikin small-pox broke out among the porters, and the town of Girri was only reached after heavy losses on March 20. On the 23rd Lieut. von Carnap started down the stream with the sick, for Bussa and Lokoja, where he received friendly aid from the officials of the Royal Niger Company. Drs. Gruner and Döring started on the same day with 56 men in a north-easterly direction for Gando, arriving on April 2. The return was made by Ilo and Kuande to Sansanne Mangu, which was reached on May 4; and on July 4 the leaders of the expedition were already sailing for Europe from Little Popo. Dr. Gruner's careful astronomical observations, for which he was particularly well-equipped, promise to supply important corrections in the map of the Western Sudan.

Captain Toutée's Expedition on the Niger.—Captain Toutée has returned to France, and on December 6 gave an account of his mission (cf. *Journal*, vol. vi. pp. 185, 386) before the Paris Geographical Society. A short outline has been published in *La Politique Coloniale* (Dec. 10). The march from Kotonu to the Niger was accomplished with little difficulty, apart from a temporary misunderstanding with the Baribas. After remaining five weeks (partly occupied in the establishment of a fortified post*) on the right bank of the Niger, the French traveller started up the river on March 25, 1895,† and reached Bussa at the head of the rapids after sixteen days' efforts. Above this point the river was quite free from rocks or rapids. In thirty days Say was reached, and eight days later, the southern limit of the desert was passed. Here the expedition narrowly escaped annihilation at the hands of the Lumatu Tuareg, who laid an ambush, but were finally repulsed, after which Captain Toutée passed the large town of Zinder, and on June 12 arrived at Tibi Farsa, whose inhabitants were subject to the commandant of Timbuktu. On the descent of the stream the Tuareg had again to be encountered, and at Kompa (Gomba) the town was found besieged by Ahmadu and Ali Bomi, two implacable enemies of the French, who were defeated, and the latter slain. The rapids below Bussa formed a much greater obstacle in the descent, the water being low, and were only passed after fourteen shipwrecks. Captain Toutée, however, finally reached the sea in the same craft in which he had started on his exploration of the river.

The Timbuktu Region.—We have already referred (vol. v. pp. 273, 384) to

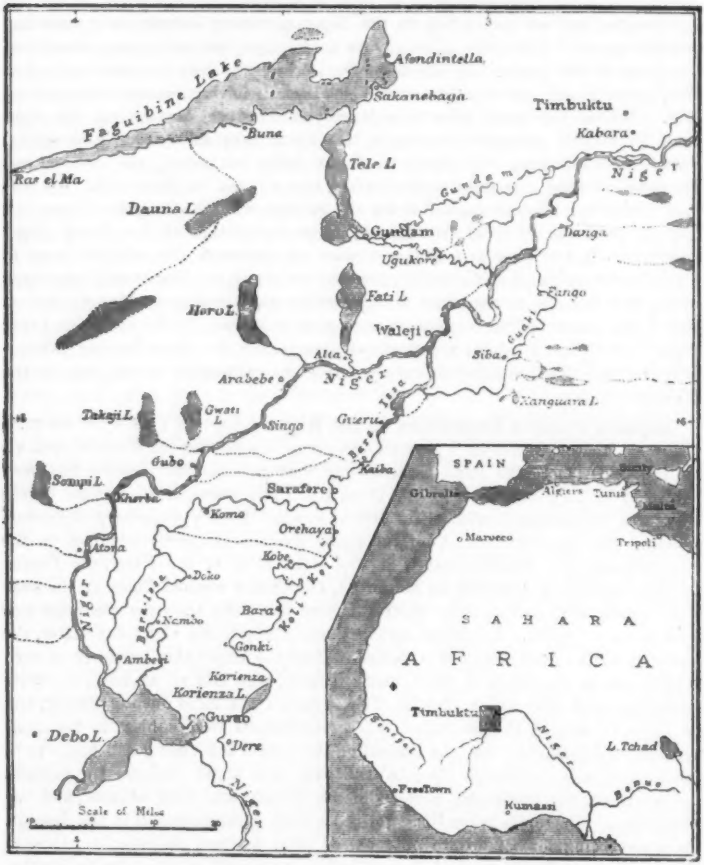
* Since abandoned, according to the latest accounts.

† Both Decoeur and Gruner had traversed the section of the river between Say and Gomba between February 1 and March 20.

the results of French surveys and investigations in the district round Timbuktu, and to the sketch-map published by the Paris Geographical Society, showing the recently explored lakes connecting with the Niger. Lieut. Bluzet has since contributed to the *Bulletin* of the same society (1895, part 3; also reprinted as a separate pamphlet) a general sketch of the Timbuktu region, accompanied by a

THE UPPER NIGER REGION.

Reduced from a Map by Lieuts. Hurst and Bluzet.



detailed map on a large scale (1 : 500,000) showing the results of all the recent explorations. Lake Debo, traversed by two branches of the Niger (from which point the writer considers the region in question to begin), is a deep lake with a clean sandy beach to the east, although its influents traverse a swamp region, intersected by channels, to the south. North of the lake the whole country for some distance from the main stream is liable to inundation at high water, while at low

water a series of lakes is left behind, connected by reedy channels with the Niger. Nearer Timbuktu these lakes have better-defined shores, bounded in many places by lines of hills. In particular, the large lake of Faquibine, joined by a narrow channel to that of Tele, north of Gundam, is shut in on the north and east by mountains, and attains a depth of 100 feet. Though very narrow towards the west, its length is no less than 68 miles. Numerous islands afford good shelter from the storms to which the lake is liable. The Gundam channel, which connects Lake Tele with the Niger, flows into or out of the lake according to the season. The whole plain in the direction of Timbuktu is annually inundated (high water occurring during the local dry season), and forms an admirable rice-field. Kabara, the port of Timbuktu, is situated at the margin of the flooded lands, and is connected with that city at high water by a winding channel, navigable for boats carrying a hundred tons during two months of the year. The seasons are not so well marked as in other parts of the Sudan. December and January are the best months, and April and May the worst; but, owing to the general dryness and the cool nights, the climate may be said to be comparatively healthy. The situation of Timbuktu renders it the natural point of exchange between the products of the north and south, the former including European goods (principally German and English stuffs) from Mogador, as well as salt (the staple product of the desert), hides, sugar, tea, etc.; while honey, wax, *Karite* butter, etc., come from the south. Besides rice, cotton and other produce thrive well, and large numbers of sheep and cattle are reared in the neighbourhood. Since the French occupation, a revival of trade is said to have set in.

Captain Bottego's New Expedition.—Captain Bottego has again set out for Somaliland, in order to supplement his former work and that of Prince Ruspoli by new explorations (*Pet. Mitt.*, 1895, No. 9). Accompanied by Lieut. Vannutelli and Dr. M. Sacchi, he has this time made Brava his starting-point for the interior, and hopes, after founding a station at Lugh, to reach the Omo by way of the upper Jub, and to finally settle the question of its termination.

AMERICA.

The British Guiana and Venezuelan Boundary Frontier.—Mr. G. G. Dixon sends the following note: "The accompanying map will give an idea of the position of the three boundary-lines which are now in dispute between Great Britain and Venezuela. The eastern portion crossed by open lines is not in dispute. The lightly shaded portion indicates Venezuela's extreme claims to territorial right. The cross-shaded portion indicates the extreme claims of Great Britain, which include the whole of the drainage area of the Essequibo river, with its tributaries, the Mazarina and Kuyuni rivers, also the Barama and Barima rivers, with their tributaries, and the land up to the right bank of the Amakuru river. Great Britain claims this as having received the territory in cession from the Dutch, who had farms and plantations on their banks. The line laid down by Sir R. Schomburgk commences at the mouth of Amakuru river, which it follows to its source, continuing round the head of the Barima and Barama rivers, to the source of the Akaribisi creek, which it follows to its junction with the Kuyuni river, then continuing up the Kuyuni to its source in Roraima mountain. The British Government are willing to go to arbitration on the territory west of the Schomburgk line, but do not recognize that Venezuela has any claim to any land east of the line. It was at the junction of the Yuruan river with the Kuyuni river that the Yuruan incident took place. The British Yuruan frontier station is situated

immediately opposite the junction of the rivers, on the right bank of the Kuyuni."

Reference should be made to the paper and accompanying maps by Mr. Dixon in the *Journal* for April, 1895.

Title to British Guiana.—The President, Mr. Clements R. Markham, C.B., contributes the following note on this subject. Although we have nothing to do with the purely political aspect of the subject here, it is interesting to note how far the British claims are based on geographical discovery. "The claims of Great Britain to the basins of the Essequibo, Demerara, and Berbice, forming British Guiana, consist of treaty right, right of discovery, and right of occupation. By the treaty of 1814 Holland transferred to Great Britain all her rights in what then became British Guiana. Spain, then in full possession of Venezuela, was a party to the treaty of 1814. Spain, therefore, recognized the rights of Great Britain, and by that act cancelled any claims she may formerly have made, based on the Bull of Pope Alexander. Those claims, absurd as they were, have not, therefore, been inherited by Venezuela. The right by occupation, inherited by Great Britain from the Dutch, dates back for upwards of three centuries. It is as old as the settlement of any part of the United States; and it has been continuous, on both banks of the Essequibo. The portions of

British Guiana which had not been occupied belong to Great Britain by right of discovery, and that right was established through the initiative of the Royal Geographical Society. Our Council resolved to prosecute those discoveries in the year 1834. With this object the Council selected an accomplished young Prussian traveller named Robert H. Schomburgk, whose ability had been brought to their notice by a valuable paper on Anegada, published in the second volume of our *Transactions*. The Council paid his expenses, advancing £900 in 1835, and drew up his instructions, which were to investigate the physical and astronomical geography of the interior of British Guiana, and to connect the positions thus ascertained with those of Humboldt on the Upper Orinoco. Schomburgk left George Town in September, 1835. In the following four years he explored the Essequibo to its source, the Berbice, the Rupununi, the Kuyuni, the Barima, and other rivers. He traversed vast tracts never before pressed by foot of white man. He discovered the great falls of the Essequibo, and named them after King William IV. as the patron of our Society; and he named the Murray falls after our President. He also established all the points at which Dutch posts had ever been formed. In 1840 Sir Robert Schomburgk received the gold medal of our Society, and in 1848 he edited Sir Walter Raleigh's 'Guiana' for the Hakluyt Society. In 1841 Sir Robert Schomburgk was appointed Her Majesty's Commissioner to survey the boundaries of Guiana. He drew a line across the basin to include the territory belonging to Great Britain by the rights of treaty and of occupancy. All beyond the line, and within the basin, belongs to Great Britain by the rights of treaty and of discovery. But by this time the Venezuelans had put forward a claim based on Pope Alexander's Bull. Great Britain has been anxious to make large concessions of her indubitable rights, for the sake of satisfying her neighbour; but her offers have not been met in a similar spirit. The title of Great Britain to British Guiana must be held to be impregnable by every impartial inquirer. It must be a source of great satisfaction to the Fellows that one part of the title, namely, the right conferred by discovery, is due entirely to the initiative taken by our Society, and to exploration undertaken at the Society's expense, and under the instructions of our Council."

Exploration of the Rio Puelo, Chile.—The Rio Puelo enters the east side of the Boca de Reloncavi in 41° 40′ S. It was explored in 1872 by Captain Vidal Gormaz up to the head of its navigation, about 23 miles in a direct line from its mouth; and now its valley has been ascended to its head by Dr. Hans Steffen and Dr. Krüger, in pursuance of their explorations in fixing the Chilian-Argentine frontier. Dr. Steffen has contributed an account of their journey, accompanied by a map on the scale of 1: 1,000,000, to *Pet. Mitt.*, 1895, No. viii. Above the point indicated he found the river to be everywhere unnavigable, mostly tearing along a series of rapids and cascades at the bottom of a deep chasm. The journey was accordingly mainly by land—the first part through a wooded plain, the second part through the remains of a forest destroyed by fire. About 60 miles in a direct line south-east of its mouth, the river was found to issue from the lower of two lakes connected by a series of violent rapids. These lakes Dr. Steffen named Lago Inferior and Lago Superior; the latter, the larger, very irregular in shape, measuring about 6½ miles in length, with an average breadth of 2½ miles, exclusive of an arm stretching to the west in the direction of the Lago Inferior. A broad longitudinal valley, containing excellent pastures, opens on the north end of Lago Superior, and here the explorers found a Chilstan colony, established two years previously. The members had found their way there by Lago Nahuel-huapi. The trade relations of the colony are at present with the Argentine government of Chubut, with which communications are maintained by a pass to the north-east,

which, being found to be the water-parting between the east and west slopes of the Andes, formed the goal of the present journey.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

North Atlantic Bottle-Voyage.—The Hydrographer of the United States Navy, Commander Sigsbee, has forwarded to us a paper which had reached him, accompanied by the following note: "Island of Flores, October 10, 1895. Dear Sir,—The enclosed paper was found near this shore of Santa Cruz on the 4th inst. As requested, please forward it on to London. Yours very respectfully (Signed) JAMES MACKAY." The enclosed is a half-sheet of blue paper a good deal bleached by sea-water, the lower part, including presumably the signature, being torn away. As far as legible, it runs as follows: "S.S. *Huntcliffe*, of West Hartlepool, 10.30 a.m., March 3, 1895. In lat. 24° 8′ N., long. 82° 11′ W. this was dropped over in a bottle. If ever picked up kindly inform Geographical Society, London; but do not incur any expense, as, all being well with weather fine and sea smooth, there is not any need to particularly notice this [paper?], as the master is merely . . . to make the light on South Key, after which he will steer for a . . ." The remaining six lines are unintelligible, owing to the action of the water; but they do not seem, judging from the few words which appear, to add anything to the information given above. We have ascertained from the owners, Messrs. Horsley and Son, of Hartlepool, that the *Huntcliffe* passed through the strait of Florida on the night of March 3, bound from Mobile for Liverpool. The bottle, having been recovered on October 4, had not been more than seven months or 214 days in the water. The shortest distance between the Strait of Florida and Flores is 2580 nautical miles, giving a minimum speed of 12 nautical miles or 14 statute miles per twenty-four hours. The bottle could not have taken the shortest route for Flores, as it would in that case have gone ashore at Bermuda, and it is unlikely that it was discovered on the day it reached the Azores. Supposing it had travelled in a curve along the southern edge of the Gulf Stream, the distance would approximate to 3000 miles, and the speed be about 15 nautical miles in twenty-four hours. This drift fully confirms the views formed from existing evidence as to the relatively high velocity of the west-flowing current in the western half of the North Atlantic Ocean.

GENERAL.

Death of Otto E. Ehlers.—This enterprising German traveller, whose death by drowning while crossing a river in German New Guinea has lately been announced, first became known to geographers by his attempted ascent of Kilimanjaro in 1888. His original claim to have reached a point over 19,000 feet above the sea evoked a lively controversy, and he himself subsequently admitted that he had been mistaken in his estimate. In 1890, after carrying the presents from the German emperor to Mandara, chief of Moshi, with which he had been intrusted, he attempted to penetrate to Lake Manyára, without, however, advancing beyond Arusha. Arriving in India in July of the same year, he made his way from Kashmir to Assam along the southern edge of the Himalayas, and, having visited Manipur, accompanied the troops who had taken part in the Manipur expedition to Mandalay. His plan of a journey through the Shan States and Siam was for a time delayed by the unfavourable time of year, the interval being spent in a visit to the Andamans, Nicobars, and Ceylon. Starting finally from Maulmein, he succeeded in crossing the Indo-Chinese peninsula to Tongking, *viâ* the Shan States, and gave an account of his journey in his book, 'Im Sattel durch Indo-China,' published in 1894. Herr Ehlers laid no claim to the character of a scientific traveller, his wanderings being rather prompted by a roving disposition

and love of adventure, but his writings contain some readable sketches of the varied incidents of travel, and of the life and manners of the races with whom he came in contact.

Vasco da Gama Celebration in Portugal.—We have received from the Geographical Society of Lisbon, which has been foremost in the promotion of the idea, official intimation that in 1897 a grand celebration of the fourth centenary of the voyage of Vasco da Gama to the East Indies will be held throughout all Portugal, and especially in Lisbon, under the auspices of the state. In view of the vast importance of that voyage for the whole history of modern civilization, it is hoped that this celebration will partake as far as possible of an international character, and the co-operation of all civilized states, and particularly of scientific bodies and individuals engaged in the study of geography, is earnestly invited by the promoters. It is hardly necessary to add that our cordial wishes for the success of the undertaking are given to the Portuguese nation.

The Tyneside Geographical Society.—The membership of this society is announced in the last annual report as 1054. A new branch of the society has been established at Tynemouth (North Shields), the branches already in existence at South Shields and Durham having proved very successful. The society is thus exercising an influence over a considerable area of the north-east of England, and the branches extend its advantages to many people interested in geography who are unable to attend the general meetings in Newcastle.

OBITUARY.

Henry Seebohm, F.L.S., F.Z.S.

By Howard Saunders, F.L.S., F.Z.S.

To the deep regret of his numerous friends and acquaintances, Mr. Henry Seebohm, one of the secretaries of this Society, succumbed to the results of an attack of influenza on the 26th of last November. He was the younger brother of Mr. Frederick Seebohm, of Hitchin, author of 'Lives of the Oxford Reformers,' 'Village Communities,' etc., and was descended from a family which, though associated with Germany for about two centuries, was of Swedish origin. Born at Bradford in 1832, Henry Seebohm displayed from his boyhood a strong taste for natural history, and to this he subsequently devoted all the time that could be spared from business. Ornithology was his favourite branch, and, like many other ornithologists, he began by collecting birds' eggs. It was not, however, till about 1872 that he could indulge in any long excursion abroad; his first expedition being to Greece and Asia Minor, where he had the good fortune to secure the aid and companionship of Dr. Theodor Krüper, the veteran explorer of the Cyclades. In the summer of 1874 Seebohm collected in Northern Norway, where his guide was Dr. R. Collett, of Christiania. The same year Mr. J. A. Harvie-Brown returned from a successful trip to Archangel and the Lower Dwina, bringing information respecting the land still further east, indicating the strong probability that *there* might be found the almost or quite unknown breeding-haunts of some of the waders, such as the grey plover, little stint, curlew-sandpiper, knot, and sanderling. So the early spring of 1875 saw Harvie-Brown and Seebohm sledging on their way to the Petchora, in North-eastern Russia, and, on the *tundras* at the mouth of that river, they succeeded in obtaining—and in practically introducing to ornithologists—the eggs of the two former species. These were figured in the 'Ibis,' in which the scientific results

of the expedition were published; while the full account of the trip appeared in a pleasantly written volume to which Seebohm gave the somewhat paradoxical title of 'Siberia in Europe.' Before this work appeared, however, Seebohm had joined Captain Wiggins, who was going to join his ship, the *Thames*, on the great river Yenesei, before the frost of 1877 broke up; and the account of this really adventurous journey by land, the descent of the river, the wreck of the *Thames*, and numberless interesting experiences were vividly described in 'Siberia in Asia.' Here again, the scientific results, given in the 'Ibis,' were very satisfactory, though they appealed rather less to the public than did those of the former work, for the line of the Yenesei lies to the east of the meridian of Calcutta, and is rather far away for the limited views of the British ornithologist. On his return, Seebohm gave an account of the above journey at an evening meeting of this Society, and many who read this notice will remember the admirable way in which he brought forward the salient features of his expedition, without a moment's hesitation or even a pause to consult a note.

Meanwhile Seebohm had paid a visit to that wonderful little island of Heligoland, which Mr. Heinrich Gätke has immortalized, and the account of bird migration as there observed forms—though unconnected—one of the most interesting chapters of 'Siberia in Europe.' Henceforward Seebohm paid considerable attention to migration, and even passed a winter in South Africa on purpose to acquire information on the subject. He also devoted himself specially to the ornithology and geography of Eastern Asia, on which he became an acknowledged authority. Meanwhile, in addition to numerous papers, he produced (in 1881) vol. v. of the 'Catalogue of Birds in the British Museum,' treating of the thrushes and warblers (*Turdidæ*), on which he was a recognized expert. In 1883 he began, and in 1885 he finished, his best-known work, 'A History of British Birds, with Coloured Illustrations of their Eggs,' in three vols. of text and one of plates; while, following the visit to Africa already mentioned, came the important quarto, 'The Geographical Distribution of Plovers, Sandpipers, and Snipes.' Notwithstanding all these subjects, the Eastern Palæarctic region was never lost sight of, and in 1890 appeared 'The Birds of the Japanese Empire.' In the same year was published 'The Classification of Birds: an Attempt to Diagnose the Subclasses, Orders, Suborders, and some of the Families of Existing Birds'—a work which received a very necessary supplement in 1895. In fact, during the last ten years Seebohm worked with almost feverish energy, and the list of his contributions would fill several pages. He employed collectors in various parts of the world; he bought up celebrated collections and presented them to the British (Natural History) Museum, and whenever ornithological science languished for want of funds, his purse was always open.

Up to last spring he was working with his accustomed energy at an important illustrated 'Monograph of the Thrushes;' but then an attack of influenza, followed by congestion of the lungs, weakened his wiry constitution, and, although he pluckily attended to his duties as secretary to this Society, as he had done for the last five years, and even took an active part in the International Geographical Congress, it was clear to his friends that his health was broken. His presence will be greatly missed here, as well as at the meetings of the Zoological Society, the Linnæan Society, and the British Ornithologists' Club—at the latter of which he was a constant attendant. Consistently with his liberality during his life, the remainder of his magnificent collection of birds and eggs is bequeathed to the Natural History Museum.

CORRESPONDENCE.

Payer's Map of Franz Josef Land.

With reference to the remarks in Mr. Montefiore's paper on the Jackson-Harmsworth Expedition in the December number of the *Geographical Journal*, I have distinctly mentioned in the account of my voyage that my map of Franz Josef Land cannot be depended upon. How can any one construct a reliable map of an extensive country if there is only an opportunity to cross it in one direction? Take, for example, the kingdom of Bohemia, and traverse it from Budweis to Bodenbach; nobody would be able to produce anything else than a tolerably reliable route-map. If more details of the country are desired, the prominent mountains require to be ascended, although any map of the surrounding country made in this way is a mere sketch; it is not surveying.

It may seem advisable to leave out all guesswork of the features of a country; but it does not seem to me desirable to recommend the discontinuance of this practice, as in that case much of what is seen would also require to be left out.

The first sketch-maps of Arctic lands are always less reliable; those who come later are expected to improve them.

Julius von Payer.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895–96.

Second Ordinary Meeting, November 25, 1895.—Clements R. Markham, Esq., C.B., F.R.S., President, in the Chair.

Elections.—*George Robert Andrews; Francis Henry Ashhurst; Edwin Swift Balch, B.A. (President Geographical Club, Philadelphia); Claude L. Barrow; Captain A. E. Bell; Samuel Lawson Booth, J.P.; John Frederick Briscoe; Edmund Broderip, J.P.; Captain J. F. Browne, R.A.; Henry G. Bryant, M.A., LL.B.; Lieut. James Montague Burn, R.E.; Count J. de Bylandt; Right Hon. Joseph Chamberlain, M.P.; Rev. Stuart Churchill, M.A.; Captain Percy L. Cox (Indian Staff Corps); J. H. Davidson-Houston (4th Royal Inniskilling, Fusiliers); Henry James Deacon; Captain C. Delmé-Radcliffe; Maxwell Earle (Grenadier Guards); Major W. T. E. Fosbery; M. F. A. Fraser; Francis Gaskell, M.A.; Right Hon. Geo. Joachim Goschen, M.P.; Rev. H. H. Gowen; Aeneas Gunn; Frederick Spencer Guy; Lieut. A. S. Hamilton; Francis R. Hart; Frederick Mitchell Hodgson; James Huddart; Charles Hare Hutchison; Francis Robert Johnson; Georges Jean Lahovary; Alexander Lang; Commander George Loy Langborne; Lieut. G. B. Macaulay, R.E.; Arthur David McCormick; Kaid Henry Aubrey de Vere Maclean; Rev. W. E. McFarlane; Rev. Septimus Martin, M.A., LL.D.; Ernest William Gurney Masterman; Lieut. Mauring; P. J. Miles; Sydney Percival Mitchelson; Captain Redmond George Sylverius Moriarty (Royal Irish Regiment); Thomas Frank Morkham; Graham Smith Nicholson; Reginald Nicholson, M.A.; Robert Palmer-Thomas; Edgar Lecky Phelps; Rev. Thomas Parry Richards, M.A.; Right Rev. Wm. M. Richardson (Bishop of Zanzibar); James Robinson; Hon. Gilbert Rollo; John Ross; E. M. Royds; Max Schoeps; Colonel Henry H. Settle, R.E.; George Simpson; Gerard Philip Torrens; William Waters Van Ness; Lieut. Frederick W. Vibert, R.N.R.; Thomas Ward; Walter A. Whittle; E. Williams; Captain Gustaf Von Zweibergh.*

The Paper read was:—

"The Færoe Islands." By Dr. Karl Grossmann.

Third Ordinary Meeting, December 9, 1895.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Edward Benest Shaw Benest; Rev. Frank Besant, M.A.; Count Richard Coudenhove; Charles Herbert Hutt; David Durell; William S. Main; Byres Moir, M.D.; Lieut. Eldred C. Pottinger, R.A.; Ake Sjogren; Joseph H. Stanley; Ferdinand Francis Zehetmayr.*

The Paper read was:—

"Exploration in the Central Alps of Japan." By the Rev. Walter Weston.

Afternoon Technical Meeting, Thursday, December 12, 1895.—W. T. BLANFORD, ESQ., LL.D., etc., Vice-President, in the Chair.

The Paper read was:—

"The Struggle for Life in the North Polar Region." By A. Trevor-Battye.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps—Graian. **Blodig and Purtscheller.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 68–119.

Aus den Bergen der Maurienne und der Tarentaise. Von Dr. Carl Blodig und L. Purtscheller. I. *With Illustrations.*

A general account of the Graian Alps.

Austria—Dalmatia—Krka. *M.G. Ges. Wien* **38** (1895): 443-450. **Gavazzi.**

Ein Beitrag zur Hydrologie der unteren Krka. Von Professor Dr. Arthur Gavazzi. *With Map.*

Austria—High Tauern. **Prielmayer.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 174–200.

Die Granatspitzgruppe in den Hohen Tauern. Von M. v. Prielmayer. *With Illustrations.*

Austria—Latitudes. **Herr and Tinter.**

Publicationen für die Internationale Erdmessung. Astronomische Arbeiten der Oesterreichischen Gradmessungs-Commission. Bestimmung der Polhöhe und des Azimutes auf den Stationen: Spieglitzer Schneeberg,

Hoher Schneeberg und Wètrnik. Ausgeführt von Professor Dr. Josef Herr. Nach dessen Tode definitiv gerechnet und herausgegeben von Professor Dr. Wilhem Tinter. Vienna, 1895. Size 12½ × 10, pp. 96.

Austria—Rainfall, etc. ———

Hydrographischer Dienst in Oesterreich. Jahrbuch des K. K. hydrographischen Central-Bureau. I. Jahrgang 1893. Vienna: W. Braumüller, 1895. Size 14½ × 10½, pp. viii. and 562. *Map and Diagrams. Presented by the K. K. Hydrographische Central Bureau, Vienna.*

This Report gives statistics of 861 rainfall-stations, and 493 stations for observing daily the levels of rivers in 1893. They are arranged in river-basins, and elaborately discussed. A map of Austria—excluding Hungary—is given on the scale of 1 : 2,250,000, showing the different drainage areas in colour, and the lines of equal rainfall for 1893 in blue.

Austria—Tyrol. *Z. Deutsch. u. Oesterr. Alpenvereins* **26** (1895): 138–173. **Platz.**

Studienfahrten im Gebiete der Vomperkette des Karwendelgebirges. Von Ernst Platz. *With Illustrations.*

Austria—Tyrol—Castles. *Z. Deutsch. u. Oesterr. Alpenvereins* **26** (1895): 44–67. **Platter.**

Schlösser und Burgen in Tirol. Von J. C. Platter. *With Illustrations.*

Austrian Alps—Malteinthal. **Kordon.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 201–258.

Touren im Bereiche des Malteinthales. Von Frido Kordon. *With Illustrations.*

Balkan Peninsula. *B.S.G. Româna* **16** (1895): 255–275. **Jannescu.**

Raţiunea geologică a principalelor aliniamente geografice, conferenţă de d-nu Lt.-Colonel G. Jannescu. *With Map.*

Danube—Inscriptions. *Ungarische Rev.* **15** (1895): 1–18. **Téglás.**

Neue Beiträge zu den Felsen-Inschriften der Katarakte in der untern Donau. (Auszug der Abhandlung des c. M. Gabriel Téglás.) *With Illustrations.*

Faeroe Islands. *Ann. Hydrographie* **23** (1895): 345–354, 403–414. **Broeker.**

Die Faerøer-Gruppe. Auf Veranlassung der Direktion der Seewarte aus dem neuesten dänischen Segelhandbuch übersetzt von Kapt. z. See a. D. Broeker. *With Plates.*

Translation of the last Danish Sailing Directions for the Faeroe islands.

France—Dordogne. *C.R.* **121** (1895): 662–664. **Bouilhac.**

Sur la mise en culture des terres de bruyères de la Dordogne. Note de M. Raoul Bouilhac.

On the utilization of waste land composed of drifting sand with an argillaceous sub-soil.

France—Tarn-et-Garonne. **Gebelin.**

Une grande industrie du Bas-Quercy. Les Chapeaux de Paille de Septfonds et de Caussade. Par Jacques Gebelin. (Extrait du Bulletin de la Société de géographie commerciale de Bordeaux, du 4 Novembre, 1895.) Bordeaux: Feret & Son, 1895. Size 10 × 6½, pp. 16. *Presented by the Author.*

The straw-hat industry was started by a shepherdess, who in 1798 taught herself to plait the straw of the district. Hat-making is now a very large trade, working in Septfonds by electric power, and turning out vast numbers of hats for horses as well as for human customers.

Germany—Aschusleben. *M. Ver. Erdk. Halle* (1895): 75–92. **Damköhler.**

Zur Sprachgrenze um Aschersleben. Von Oberlehrer Ed. Damköhler in Blankenburg a. H.

Germany—Erfurt. *M. Ver. Erdk. Halle* (1895): 1–12. **Kirchhoff.**

Die Lagenverhältnisse von Erfurt . . . von Prof. Dr. A. Kirchhoff.

Germany—Geodesy. ———

Jahresbericht des Direktors des Königlichen Geodätischen Instituts für die Zeit von April 1894 bis April 1895. Berlin: P. Stankiewicz, 1895. Size 9 × 6½, pp. 34.

Germany—Races and Religions. *Petermanns M.* **41** (1895): 249–252. **Langhans.**

Fremde Volksstämme im Deutschen Reich, verglichen mit der Verteilung der Glaubensbekenntnisse. Von P. Langhans. *With Map.*

Germany—Rainfall. ———

Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. Herausgegeben durch dessen Direktor Wilhelm von Bezold. Ergebnisse der Niederschlags-Beobachtungen im Jahre 1893. Berlin: A. Asher & Co., 1895. Size 13 × 10, pp. lii. and 202. *Map. Presented by the K. Meteorologische Institut, Berlin.*

Germany—Schwarzburg-Sondershausen. **Toepfer.**

M. Ver. Erdk. Halle (1895): 14–75.

Die Wald- und Wasserverhältnisse des Fürstentums Schwarzburg-Sondershausen . . . von Realschuldirektor Dr. H. Toepfer.

Germany—Thunderstorms. **Assmann.**

Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts, herausgegeben durch dessen Direktor Wilhelm von Bezold. Ergebnisse der Gewitter-Beobachtungen im Jahre 1891. Von Prof. Dr. Assmann. Berlin: A. Asher & Co., 1895. Size 13½ × 10, pp. lii. and 20. *Diagrams.*

Grecian Archipelago—Andros. *B.S.R. Belge G.* **19** (1895): 429–458. **Hauttecœur.**

Andros. Par Henry Hauttecœur.

Greece. **Hartl.**

Meteorologische und Magnetische Beobachtungen in Griechenland. Ausgeführt von Heinrich Hartl. Separat-Abdruck aus den "Mittheilungen des k. u. k. militär-geographischen Institutes." XIV. Band. Vienna, 1895. Size 9 × 6½, pp. 56. *Map and Diagrams. Presented by the Author.*

Hungary—Budapest. **Körösi and Thirring.**

Publicationen des Statistischen Bureaus des Haupt- und Residenzstadt Budapest. XXV. 2. Die Hauptstadt Budapest im Jahre 1891. Resultate der Volksbeschreibung und Volkszählung. Von Josef Körösi und Dr. Gustav Thirring. Zweiter Band. Berlin: Puttkammer and Mühlbrecht, 1895. Size 11 × 8, pp. 120, and 98. *Maps and Diagram. Price 5 mark. Presented by Mr. Joseph Körösi.*

This contains a series of interesting statistical maps of Budapest, showing in colour the percentage of Roman Catholics, of Jews, of Hungarians, Germans, of persons speaking Magyar, and of illiterates over ten years of age, in each division of the city. A separate map is devoted to each of the distributions mentioned.

Italy. *Deutsche G. Blätter* **18** (1895): 225–247. **Husmann.**

Die Reiskultur in Italien. Von Emil Husmann. II. *With Map.*

Italy—Lakes. *Globus* **68** (1895): 224–227. **Halbfass.**

Die Seenforschung in Italien. Von Dr. Wilhelm Halbfass, Neuhaldensleben.

A summary of recent limnological researches in Italy.

Italy—Map. **Pomba.**

L'Aspect physique de l'Italie, relief à surface convexe à l'échelle de 1 millionième et à hauteurs proportionnelles; imaginé et construit (1880–84), par César Pomba. Dessin et reliefs de G. Henri Fritzsche. Mémoire présenté par l'Auteur au Congrès Géographique International de Londres en 1895. Turin, 1895. Size 11 × 7½, pp. 36. *Plate. Presented by the Author.*

Mediterranean Basin. **Hull.**

On the Physical Conditions of the Mediterranean Basin, which have given rise to a community of some species of Fresh-water Fishes in the Nile and the Jordan Basins. By Professor Edward Hull. London: Victoria Institute [n. d.]. Size 8½ × 5½, pp. 10. *Map. Presented by the Author.*

Mediterranean—Columbretes. **Ludwig Salvator.**

Columbretes. Prague: H. Mercy, 1895. Size 13 × 10, pp. 178. *Maps, Plates, etc. Presented by H.I.H. the Archduke Ludwig Salvator.*

One of the sumptuous quartos which H.I.H. the Archduke Ludwig Salvator of Austria has devoted to the Mediterranean islands. Tables of the meteorology of the

island, an account of the lithology of its rocks, a short description of fauna and flora, and a general account of the little group are comprised in the volume, which is illustrated by very clever sketches.

Montenegro. *Z. Ges. Erdk. Berlin* **30** (1895): 375–405. **Hassert.**
Die natürlichen und politischen Grenzen von Montenegro. Von Dr. Kurt Hassert.

Norway—Geodesy. **Schiötz.**
Die norwegische Commission der Europäischen Gradmessung. Resultate der im Sommer 1894 in dem südlichsten Theile Norwegens ausgeführten Pendelbeobachtungen von O. E. Schiötz. Christiania: J. Dybwad, 1895. Size 11 × 7½, pp. 16.

Norway—Geodetic Observations. — —
Publication der Norwegischen Commission der Europäischen Gradmessung. Astronomische Beobachtungen und Vergleichung der astronomischen und geodätischen Resultate. Christiania, 1895. Size 11½ × 9, pp. xxvi. and 100. *Map.*

Norway—Jostedal. **Martel.**
Madame Aline Martel. Traversée du Glacier du Jostedal Norvège. Extrait de l'Annuaire du Club Alpin Français 21e volume — 1894. Paris: Typ. Chamerot & Renonard, 1895. Size 9 × 6, pp. 16. *Plates. Presented by the Author.*

Portugal—Agriculture. **Pereira.**
Apontamentos para a Historia das Industrias Portuguezas. A Industria agraria. Por J. M. Esteves Pereira. Lisbon, 1895. Size 7½ × 5½, pp. 112. *Presented by the Author.*

Pyrenees. *Ann. Club Alpin Français* **21**, 1894 (1895): 424–468. **Belloc.**
Recherches et explorations orographiques et lacustres dans les Pyrénées centrales. Par M. Émile Belloc. *With Map and Illustrations.*

Pyrenees—Glaciers. *Ann. Club Alpin Français* **21**, 1894 (1895): 403–423. **Schrader.**
Sur l'étendue des glaciers des Pyrénées. Par M. F. Schrader.

Russia—Finland. *Globus* **68** (1895): 53–57, 74–80, 87–90, 108–112, 123–126. **Köppen.**
Die Kulturentwickelung Finnlands. Von N. v. Köppen. Dorpat.

Russia—Lakes. *Globus* **68** (1895): 334–336. **Krahmer.**
Die Seen der Gouvernements Twer, Pskow und Smolensk. Von Krahmer.
An abstract of Professor Anuchin's Russian work on the lakes of European Russia.

Russia—Samara. *Ann. G.* **5** (1895): 50–58. **d'Almeida.**
La colonisation russe contemporaine le long de la Volga. Par M. P. Camena d'Almeida.

Southern Europe—Adige. *Z. Deutsch. u. Oesterr. Alpenvereins* **26** (1895): 1–15. **Penck.**
Die Etsch. Von Albrecht Penck.
A geological, hydrographical, and general geographical account of the river Adige from its sources to the Adriatic.

Spain—Village Communities. *Quarterly Rev.* **182** (1895): 483–507. ——
Village Communities in Spain.

Sweden—Longitude determinations. **Rosén.**
K. Svensk. Vet.-A. Handlingar **26** (1894): 1–67.
Telegraphische Längenbestimmungen zwischen Lund, Göteborg, Stockholm, Hernö und Torneå, ausgeführt von P. G. Rosén und R. Larssen. Redigirt von P. G. Rosén.

Sweden—Zoological Station. **Théel.**
Om sveriges zoologiska hafsstation Kristineberg. Af Hjalmar Théel. Stockholm: P. A. Norstedt & Sons, 1895. Size 9 × 6, pp. 48. *Plans and Plates, Map.*

Turkey—Lemnos. *Ann. Club Alpin F.* **21**, 1894 (1895): 279–322. **De Launay.**
L'île de Lemnos. Par M. L. De Launay. *With Map and Illustrations.*

United Kingdom—England—Devon. **Peek**

Rousdon Observatory, Devon. Volume XI. Meteorological Observations for the year 1894, made under the superintendence of Cuthbert E. Peek. London: Printed by Sir J. Causton and Sons, 1895. Size 11½ × 9, pp. 34. *Plate. Presented by Cuthbert E. Peek, Esq.*

United Kingdom—England and Wales—Gazetteer. **Brabner.**

The Comprehensive Gazetteer of England and Wales. Edited by J. H. F. Brabner, [Vol. vi. She-Zou.] London: W. Mackenzie, [1895]. Size 10½ × 7½, pp. 392. *Maps, Plan, and Plates. Presented by the Editor.*

This Gazetteer is now completed, and will be specially noticed in an article on recent Gazetteers.

United Kingdom—English Topography. **Milne.**

The Gentleman's Magazine Library, being a classified collection of the chief contents of the *Gentleman's Magazine* from 1731 to 1868. Edited by George Laurence Gomme. English Topography, Part V. (Hampshire—Huntingdonshire). Edited by F. A. Milne. London: E. Stock, 1894. Size 9½ × 6, pp. xii. and 150. *Price 7s. 6d.*

United Kingdom—Scotland—Tay. **Cunningham.**

P.I. Civil Engineers **120** (1895): 299–313.

The Estuary of the Tay. By David Cunningham.

Mr. Cunningham, the harbour-engineer of Dundee, describes the physical condition of the Tay estuary with regard to its shifting sandbanks and the tidal conditions of the water.

Western Europe—Rainfall. *Ann. G.* **5** (1895): 15–24. **Angot.**

Sur le régime pluviométrique de l'Europe occidentale. Par M. A. Angot. *With Map.*

The map shows the average annual rainfall for the period 1861–90, and includes Europe as far east as Rome and Stockholm, and as far north as 60°.

ASIA.

Arabia. *Nineteenth Century* (1895): 595–613. **Bent.**

The Land of Frankincense and Myrrh. By J. Theodore Bent.

Arabia—Muscat. *Contemporary Rev.* (1895): 871–882. **Bent.**

Muscat. By J. Theodore Bent.

Armenia—Ararat. **Rickmer-Rickmers.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 315–326.

Ararat. Von Willy Rickmer-Rickmers.

Baluchistan. *J.S. Arts* **43** (1895): 702–712. **Yates.**

The Northern Balochis, their Customs and Folk-lore. By Oswald V. Yates.

Borneo. *Petermanns M.* **41** (1895): 201–208. **Molengraaff.**

Die niederländische Expedition nach Zentral-Borneo in den Jahren 1893 und 1894. Von Prof. Dr. G. A. F. Molengraaff in Amsterdam. *With Map.*

This was noticed in the *Journal* for December, 1895, vol. vi., p. 572.

Central Asia. *Verh. Ges. Erdk. Berlin* **22** (1895): 539–557. **Hedin.**

Von Herrn Dr. Sven Hedin über seine Reise durch die Takla-Makan-Wüste. *With Map.*

China.

China. Imperial Maritime Customs. I. Statistical Series, Nos. 3 and 4: Returns of Trade and Trade Reports for the year 1894. Part II. Reports and Statistics for each Port. With Report on Foreign Trade of China. Shanghai: the Statistical Department of the Inspectorate-General of Customs, 1895. Size 11½ × 9, pp. viii., iv., and 632. *Diagrams.*

Ditto. No. 6. Decennial Reports on the Trade, Navigation, Industries, etc., of the Ports open to Foreign Commerce in China and Corea, and on the condition and development of the Treaty Port Provinces, 1882–91. First Issue. With sundry maps and a sketch-plan of each port; also

statistical tables relating to the foreign trade of China. Shanghai: Kelly & Walsh; London: P. S. King & Son, 1893. Size 11½ × 9, pp. xii., 694, and lxxxiv. *Presented by the Inspector-General of Customs, Shanghai.*

China—Yangtse Kiang. **Coucheron-Aamot.**

Norske G. Selsk. Aarb. **6**, 1894–1895 (1895): 95–124.

2500 kilometer opover Yangtse Kiang åf W. Coucheron-Aamot. *With Map and Illustrations.*

The author was an officer on a Chinese gunboat when he made the journey on the Yangtse which is here described.

Chinese Empire—Mongolia. **Iwanowski.**

Die Mongolei-Ethnographische Skizze. Von Dr. Al. Iwanowski. Leipzig: Jüstel & Göttel, 1895. Size 9 × 6½, pp. 28. *Presented by the Author.*

Chinese Miscellany. **Mesny.**

Mesny's Chinese Miscellany. Vol. I. No. 1. Shanghai: printed at the *China Gazette* Office, 1895. Size 11½ × 9, pp. 24.

The first number of a new weekly journal devoted to miscellaneous information regarding China and the Chinese.

Formosa. *Scottish G. Mag.* **11** (1895): 553–570. **Dodd.**

Formosa. By John Dodd.

A full abstract of the paper read to the British Association at Ipswich, which was noticed in the *Journal* for November, 1895, vol. vi, p. 463.

French Indo-China. *Rev. Scientifique* (4 S.) **4** (1895): 715–718. **d'Enjoy.**

Une incursion chez les Moï. Par M. Paul d'Enjoy.

French Indo-China. *Rev. Française* **20** (1895): 715–719. **Mercié.**

De l'Annam au Mékong. Exploration E. Mercié.

French Indo-China—Tonkin. *Rev. G. Internationale* **20** (1895): 93–98. **Renaud.**

La France à l'Extérieur. Les Travaux publics et les Chemins de fer au Tonkin. Par Georges Renaud. *With Maps and Plate.*

India. *Nineteenth Century* (1895): 870–888. **Colvin.**

Indian Frontiers and Indian Finance. By Sir Auckland Colvin. *With Sketch-map.*

India—Central—Himalayas. **Diener.**

Z. Deutsch. u. Oesterr. Alpenvereins **26** (1895): 269–314.

Mittheilungen über eine Reise im Central-Himalaya von Kumaon, Gurhwal, und den angrenzenden Theilen von Tibet. Von Dr. Carl Diener. *With Illustrations.*

India—Chitral. *Imp. and Asiatic Quarterly Rev.* (2) **10** (1895): 288–311. **Leitner.**

New Dangers and Fresh Wrongs. By Dr. G. W. Leitner. I. The Chitrál Blue-book and Kafiristán. II. The Suppressed Treaties and the Ignored Proclamation. *With Illustrations.*

A separate copy has also been presented by the Author.

India—Frontier. ———

Treaty Series. No. 19, 1894. Convention between Great Britain and China, giving effect to Article III. of the Convention of July 24, 1886, relative to Burmah and Thibet. Signed at London, March 1, 1894. [Ratifications exchanged at London, August 23, 1894.] London: Printed for Her Majesty's Stationery Office, by Harrison & Sons, 1894. Size 10 × 6½, pp. 10. *Map. Price 7d.*

The definition of the frontiers between India and China is given in this paper.

India—Kashmir. *Nineteenth Century* (1895): 931–946. **Griffin.**

Kashmir. By Sir Lepel Griffin, K.C.S.I.

India—Kashmir. **Lawrence.**

The Valley of Kashmir. By Walter R. Lawrence. London: H. Frowde, 1895. Size 10½ + 8, pp. 478. *Map and Plates. Presented by the Publisher.*

This account of Kashmir is full and authoritative. It deals with the country under the heads—Introductory, Descriptive, Geological, Flora, Fauna, Archæology, Political

History, Physical History, Statistical, Social Life, Religions, Races and Tribes, Agriculture and Cultivation, Live-stock, Industries and Occupations, Trade, the Old Administration, the New Settlement, Language. Special notice will be taken of the book in the *Journal*.

Palestine—Beyond Jordan. *Le Globe* (*Mémoires*) **34** (1895): 109–170. **Gautier.**

Au dela du Jourdain. Souvenirs d'une excursion faite en mars 1894 . . . par M. Lucien Gautier. *With Plates.*

Palestine—Moab and Gilead. **Bliss.**

Palestine Exploration Fund, Q. Statement (1895): 203–235.

Narrative of an Expedition to Moab and Gilead in March, 1895. By Frederick Jonas Bliss, PH.D. *With Map, Plans, and Illustrations.*

A provisional report of the rich archæological discoveries made by Dr. Bliss in his journey beyond the Dead Sea valley last year. It is illustrated by photographs of the ruins, and of some fine pieces of mosaic work.

Persia. **Morgan.**

Mission Scientifique en Perse. Par J. de Morgan. Tome Troisième. Études géologiques. Partie II. Paléontologie, par MM. G. Cotteau, V. Gauthier et H. Douvillé. Paris: E. Leroux, 1895. Size 11½ × 9, pp. 142. *Plates.* Ditto. Cartes des rives méridionales de la Mer Caspienne du Kurdistan, du Moukri et de l'Élam. Paris: E. Leroux, 1895. Size 15½ × 11.

Philippine Islands—Health. **Barcones.**

Estudios para una Nosologia Filipina. Por Enrique Mateo Barcones. Madrid, 1895. Size 7½ × 5, pp. 448. *Presented by the Author.*

On the diseases of the Philippine Islands.

Siam. **Fournereau.**

Ministère de l'Instruction Publique. Annales de Musée Guimet. Tome Vingt-Septième. Le Siam Ancien, Archéologie—Épigraphie—Géographie. Par Lucien Fournereau. Première Partie. Paris: E. Leroux, 1895. Size 11½ × 9, pp. xii. and 322. *Plates and Facsimile Maps. Presented by the Author.*

This work will be specially noticed.

Siberia—Lena Delta. **Fuss, Müller, and Jürgens.**

Beobachtungen der Russischen Polarstation an der Lenamündung. I. Theil. Astronomische und Magnetische Beobachtungen, 1882–1884. Bearbeitet von V. Fuss, F. Müller und N. Jürgens. Herausgegeben unter redaction von Dr. A. v. Tillo, 1895. Size 13 × 10, pp. iv. (88), 166, 96, and vi. *Maps, Plates, and Portraits. Presented by the Imperial Russian Geographical Society.*

Turkey in Asia—Armenian Question. *Blackwood's Mag.* (1895): 483–492. **Harris.**

An unbiassed view of the Armenian Question. By Walter B. Harris.

AFRICA.

Africa. *Scottish G. Mag.* **11** (1895): 512–518. **Elliot.**

Africa as a Field for Colonial Enterprise. By G. F. Scott Elliot.

Africa and British Interests. *J.R. Colonial I.* **27** (1895): 7–44. **Lugard.**

The Extension of British Influence (and Trade) in Africa. By Captain F. D. Lugard, C.B., etc.

Africa—Desiccation. *G.Z.* **1** (1895): 425–435. **Reichard.**

Zur Frage der Austrocknung Afrikas. Nach eigenen Beobachtungen. Von Paul Reichard.

British East Africa—Railway. **Molesworth.**

Report by Sir Guilford Molesworth on proposed Railway from Mombasa to Victoria Nyanza, 1895. Size 13½ × 8½, pp. 8. *Map, Diagram, and Sections. Presented by the Author.*

Canary Islands. *B.S.R.G. d'Anvers* **19** (1895): 276–310; **20** (1895): 202–365. **Donnet.**

Les Anversois aux Canaries (un voyage mouvementé au XVI.e siècle). Par M. Fernand Donnet.

Canary Islands—Teneriffe. *G.Z.* **1** (1895): 556–580. **Meyer.**
Die Insel Tenerife und ihre Bewohner. Von Dr. Hans Meyer in Leipzig. *With Map.*

Central Africa. *Mouvement G.* **12** (1895): 289–292. **Wauters.**
Encore la question de la priorité de la découverte de l'Afrique centrale. Par A. J. Wauters. *With Map.*

Congo Basin—Historical. *G.Z.* **1** (1895): 516–521. **Pahde.**
Die Erforschung des Kongo-Systems. Von Dr. Adolf Pahde.

East Africa—Somali Land. *Koloniales Jahrb.* **8** (1895): 161–171. **Bornhaupt.**
Die deutschen Bestrebungen an der Somali-Küste und das englisch-italienische Abkommen vom 5 Mai, 1894. Im Auftrage der Deutschen Kolonialgesellschaft, bearbeitet von Chr. von Bornhaupt.

East Africa—Somali Land. *J. United Service I. India* **24** (1895): 295-324. **Wellby.**
A trip in Somali Land. By Captain Wellby. *With Map.*
Narrative of a sporting trip south of Berbera.

East Africa—Upper Nile. *Scottish G. Mag.* **11** (1895): 571–581. **Heatley.**
The Port of the Upper Nile in relation to the Highways of Foreign Trade. By James Turnbull Playfair Heatley.
Full text of a paper read at the British Association, an abstract of which appears in the *Journal* for December, 1895, vol. vi. p. 571.

Egypt. **Fircks.**
Aegypten 1894. Staatsrechtliche Verhältnisse, wirthschaftlicher Zustand, Verwaltung. Nach amtlichen und anderen Quellen sowie eigenen Wahrnehmungen dargestellt von A. Frhr. von Fircks. Erster Theil. Berlin: D. Reimer (Hoefer und Vohsen), 1895. Size 8½ × 6, pp. viii. and 300. *Maps. Presented by the Publishers.*
The first part of a work on Egypt, containing an account of the political development of the country, a sketch of the geography, fauna, flora, and resources of the land, a full account of the people, and reports on the present commercial and political conditions. There are numerous statistical tables, and an excellent map by R. Kiepert.

Madagascar. **Caustier, and others.**
Publication de la Revue Générale des Sciences. E. Caustier—A. Milne-Edwards—De Faymoreau—L. Suberbie—G. Foucart—Dr. Lacaze—L. Olivier. Ce qu'il faut connaitre de Madagascar. Population—Resources Commerce—Avenir de l'île. Paris: P. Ollendorff [1895, not dated]. Size 12 × 8, pp. 110.. *Maps and Illustrations. Price* 3 *fr.* 50 *c.*
A series of authoritative articles, excellently illustrated by photographic reproductions.

South Africa. **Keane.**
Stanford's Compendium of Geography and Travel (New Issue). Africa. Vol. ii. South Africa. By A. H. Keane. London: E. Stanford, 1895. Size 8 × 5½, pp. xvi. and 672. *Maps and Illustrations. Price* 15*s. Presented by the Publisher.*
This will be specially noticed, together with other recent works relating to Africa.

Transvaal. *Rev. Scientifique* (4) **4** (1895): 193–203. **Diamanti.**
Le Transvaal. État politique, économique et commercial. Par M. Octave Diamanti. *With Map.*

Tripoli—Cyrenaica. **Rainaud.**
La Pentapole cyrénéenne et la colonisation. Par M. A. Rainaud. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session—Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 412-443.

Tropical Africa. *Nineteenth Century* (1895): 442–454. **Lugard.**
New British Markets. III. Tropical Africa. By Captain F. D. Lugard.

West Africa. *Ann. Hydrographie* **23** (1895): 241–244. **Bachem.**
Fahrt in den Bimbia-Fluss und Reise von Kamerun nach Togo und zurück. Hydrographische und meteorologische Notizen S.M.S. "Hyäne," Kommandant Kapt.-Lieut. Bachem. *With Plate.*

West Africa. *M. Deutschen Schutzgeb.* **8** (1895): 184–190. **Limpricht.**
Begleitworte zu den Karten "Reiseroute der Expedition des deutschen Kamerunkomitees." Von Dr. M. Limpricht. *With Maps.*

West Africa. *Scottish G. Mag.* **11** (1895): 609–625. **Lugard.**
A Journey in West Africa, and some points of contrast with East Africa. By Captain F. D. Lugard.

West Africa. *B. Comité l'Afrique Française* **5** (1895): 290–298. **Marchand.**
Sept ans d'Afrique, La mission du Capitaine Marchand. *With Maps and Portrait.*

West Africa—Gold Coast. *Globus* **68** (1895): 149–151, 169–172, 189–191. **Mähly.**
Studien von Goldküste. Von Dr. med. Ernst Mähly.

West Africa—Niger Expeditions. *Globus* **68** (1895): 296–298. **Förster.**
Ueberblick über die Niger-Expeditionen der Deutschen, Engländer und Franzosen 1895. Von Brix Förster. *With Map.*

West Africa—Sanga River. *Ann. G.* **5** (1895): 72–89. **Ponel.**
La Haute-Sangha. Par M. Ed. Ponel. *With Map.*

NORTH AMERICA.

Canada. *J. Manchester G.S.* **10**, 1894 (1895): 253–270. **Derby.**
Canada. By the Right Hon. the Earl of Derby.

Canada—Forests. *P. and T.R.S. Canada* **12**, 1894 (1895): 3–20. **Macoun.**
The Forests of Canada and their Distribution, with Notes on the more Interesting Species. By John Macoun.

Canada—Geological Survey Report. ——
Geological Survey of Canada, Alfred R. C. Selwyn, director. Annual Report (New Series), Vol. VI. Reports A (1892), A (1893), J, Q, R, S (1892–93). Ottawa: 1895. Size 10 × 7, pp. x., 96, 98, 16, 22, 94, and 212. *Map and Diagrams. Presented by the Geological Survey of Canada.*

Canada—North-West. **Somerset.**
The Land of the Muskeg. By H. Somers Somerset. With a Preface by A. Hungerford Pollen. London: W. Heinemann, 1895. Size 9½ × 6½, pp. xxxii. and 248. *Portrait, Maps, and Illustrations. Price* 14*s.*

An interesting narrative of a journey in the interior of the less known parts of Northern America.

Mississippi Valley. *J. Geology* **3** (1895): 740–763. **Leverett.**
The Preglacial Valleys of the Mississippi and its tributaries. By Frank Leverett.

North America—Cabots. *P. and T.R.S. Canada* **12**, 1894 (1895): 51–112. **Dawson.**
The Voyages of the Cabots in 1497 and 1498; with an attempt to determine their landfall and to identify their island of St. John. By Samuel Edward Dawson. *With Facsimiles.*

North America—Cartier. *P. and T.R.S. Canada* **12**, 1894 (1895): 151–182. **Howley.**
Cartier's Course—a Last Word. By the Right Reverend M. F. Howley, West Newfoundland. *With Facsimiles, etc.*

United States—Mineral Waters. **Peale.**
Natural Mineral Waters of the United States. By A. C. Peale. With Maps.—Fourteenth Annual Report of the United States Geological Survey, 1892–93. By J. W. Powell, Director. Part II. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 49–88. *Presented by the U.S. Geological Survey.*

Two maps are given, showing the distribution of mineral springs of commercial importance in all parts of the United States.

United States—New England States. ——
A Summary of the Vital Statistics of the New England States for the year 1892. Boston: Damrell and Upham [1895]. Size 9½ × 6, pp. 60. *Map. Presented by Gardner T. Swarts, Secretary of the State Board of Health, Providence, R I.*

United States—Niagara. ——

Eleventh Annual Report of the Commissioners of the State Reservation at Niagara for the Fiscal Year from Oct. 1, 1893, to Sept. 30, 1894. The Duration of Niagara Falls and the History of the Great Lakes, 1881–1894. By J. W. Spencer. Second Edition. Albany, 1895. Size 9 × 6, pp. 86 and 126. *Maps and Plates. Presented by Andrew H. Green, President of the Commissioners.*

United States—Stream Measurements. **Newell.**

Results of Stream Measurements. By F. H. Newell.—Fourteenth Annual Report of the United States Geological Survey, . . . 1892–93. By J. W. Powell, Director. Part II. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 89–156. *Maps, Diagrams, and Illustrations. Presented by the U.S. Geological Survey.*

The instruments employed in recording river-levels and measuring discharge are first described, and then the records, with diagrams, of the seasonal variations in the Arkansas, Rio Grande, East Carson, Bear, Weber, Provo, Teton, Snake, and Owhyhee rivers are given. These are all in the Rocky Mountain states.

CENTRAL AND SOUTH AMERICA.

Brazil. **Cruls.**

Commission d'Exploration du Plateau Central du Brésil. Rapport présenté à son Ex. M. le Ministre de l'Industrie, de la Voirie et des Travaux Publics. Par L. Cruls, Chef de la Commission. Rio de Janeiro: H. Lombaerts & C., 1894. Size 13 × 9½, pp. viii., viii., and 368. *Plates.*
Ditto. Atlas des Itinéraires, des Profils longitudinaux et de la Zône démarquée, publié par L. Cruls. Rio de Janeiro: H. Lombaerts & C., 1894. Size 18½ × 13½.

This work will be specially noticed.

Brazil—Itatiaya. *G. Tidskrift* **13** (1895): 49–56. **Bøving-Petersen.**

En Bestigning af Brasiliens højeste Bjærg. Ved cand. mag. Bøving-Petersen.

An account of the climbing of Mount Italiaya, the highest summit of Brazil.

Brazil—Rio S. Francisco. *Rev. Trim. I. G. e Hist. Bahia* **2** (1895): 275–279. ——

A navegação dos affluentes do Rio S. Francisco.

Central America. *Petermanns M.* **41** (1895): 117–186. **Sapper.**

Beiträge zur Ethnographie von Südost-Mexiko und Britisch-Honduras. Von Dr. C. Sapper. *With Map.*

Central America—Mexican boundary. **Polakowsky.**

M.G. Ges. Wien **38** (1895): 321–324.

Die Grenze zwischen Mexico und Guatemala. Von Dr. H. Polakowsky. *With Map.*

Central America—Yucatan. *Globus* **68** (1895): 247–252, 277–284. **Maler.**

Yukatekische Forschungen. Von Teobert Maler. *With Illustrations.*

These illustrations of the ruins of Yucatan practically occupy the whole of two parts of *Globus.*

Chile—Rio Puelo. *Petermanns M.* **41** (1895): 190–193. **Steffen.**

Die Erforschung des Rio Puelo. Von Dr. Hans Steffen. *With Map.*

Chile—Sailing directions. **Chaigneau.**

Instrucciones Nauticas de la Costa de Chile. Primera Parte. (De Llanquihue a Coquimbo.) Por J. Federico Chaigneau. Santiago de Chile, 1895. Size 10½ × 7½, pp. vi. and 150. *Plates. Presented by the Chilian Hydrographical Department.*

Chile—Talcahuano. **Fagalde.**

El Puerto de Talcahuano i sus obras de mejoramiento. Dique de Carena. —Arsenal Maritimo.—Dársenas Militar i Comercial. Por Alberto Fagalde. Santiago de Chile, 1895. Size 9½ × 6½, pp. xcviii. and 180. *Plans and Plates. Presented by the Chilian Hydrographic Office.*

AUSTRALASIA AND OCEANIC ISLANDS.

Australia—Anthropology. **Mathews.**

P. and T. Queensland Br. R.G.S. Australasia **10** (1895): 46–70.

The Aboriginal Rock Pictures of Australia. By R. H. Mathews. *With Plates.*

Australia—Year-Book. **Greville.**

The Year-Book of Australia for 1895. Edited by the Hon. Edward Greville. Sydney, etc. (London: E. Stanford & Effingham Wilson) [1895]. Size 9 × 6, pp. lxvi. and 728. *Maps. Presented by the Editor.*

A valuable book of reference on all matters relating to the Australasian colonies.

Australian Natives' Customs. **Mathews.**

J. and P.R.S. New South Wales **28** (1894): 98–129.

Aboriginal Bora held at Gundabloni in 1894. By R. H. Mathews. *With Plates.*

British New Guinea. *J. Manchester G.S.* **10**, 1894 (1895): 271–285. **Macgregor.**

British New Guinea. By Sir W. Macgregor.

Caroline Islands. (*American*) *Missionary Herald* **91** (1895): 311–314. **Price.**

Notes on Ruk and the Mortlock Islands. By Rev. F. M. Price, of Ruk. *With Map and Illustration.*

New Caledonia. **Bernard.**

L'Archipel de la Nouvelle-Calédonie. Par Augustin Bernard. Paris: Hachette & Co., 1895. Size 10 × 6½, pp. xxiv. and 458. *Maps. Price* 10*s.*

An excellent geographical monograph showing wide reading in English and German literature as well as French, and a grasp of the principles of Geography. The first part deals with the origin and structure of the island, considering the various land-forming agencies involved, and thereby explaining the configuration. Large scale geological and orographical maps are given. The second part considers the climate, fauna, and flora at considerable length. The third part treats of man, discussing first the aborigines, then the history of discovery, and finally the history of French colonization and the penal system. The work altogether is one on which geographers will not hesitate to congratulate the author.

New South Wales. *P.R.S. Victoria* **7** (N.S.), (1895): 143—156. **Mathews.**

Aboriginal Rock Paintings and Carvings in New South Wales. By R. H. Mathews. *With Plates.*

New Zealand. *New Zealand Alpine J.* **2** (1895): 107–125. **Fitzgerald.**

Mr. E. A. Fitzgerald's Work in New Zealand (2nd notice).

New Zealand—Canterbury and Westland. **Meeson.**

New Zealand Alpine J. **2** (1895): 27–29.

Notes on the Meteorology of Canterbury and Westland, as bearing upon the Features of their Glaciers. By the Editor [J. T. Meeson].

New Zealand—Ruapehu. *New Zealand Alpine J.* **2** (1895): 71–82. **Allison and Hill.**

Early Ascent of Ruapehu. By Thomas Allison.

Ruapehu: Retrospect and Prospect. By H. Hill.

Queensland. ———

1895. Queensland. Annual Progress Report of the Geological Survey for the year 1894. Brisbane, 1895. Size 13½ × 8½, pp. 32. *Maps. Presented by Mr. R. L. Jack, Government Geologist.*

Western Australia. *J. R. Colonial I.* **26** (1895): 566—590. **Robinson.**

Western Australia. By Sir William C. F. Robinson.

Western Australia—Blue Book. ———

Western Australia. Blue Book for the year 1894. Compiled from Official Returns in the Registrar-General's Office, Perth, W.A. R. Pether, 1895. Size 13 × 8½, pp. 380.

Full statistics for the colony up to the end of 1895.

Western Australia—Year-Book. **Fraser.**

Western Australian Year-Book for 1893–94 (eighth year of issue). By Malcolm A. C. Fraser. Perth, 1895. Size 8½ × 5½, pp. x. and 352. *Map.*

The number of commercial companies being floated for the development of Western Australia makes the official statistics of that colony very important in this country; and this year-book, dealing exclusively with official facts, may be accepted as an authoritative account of Western Australia as it is.

POLAR REGIONS.

Greenland. **Garde.**

Tour du Monde **1** (N.S.), (1895): 385, 405, 417, 429, 441, 453, 465, 477.
Un été au Grœnland. Par M. Th. V. Garde. Traduit du danois par Charles Rabot. *With Map and Illustrations.*

Peary's Arctic Journey. *Norske G. Selsk. Aarb.* **6**, 1894–1895 (1895): 80–94. **Astrup.**
Det arktiske problem og de to Peary—expeditioner. Slædereise til Melvillebugten af Eivind Astrup. *With Map and Plate.*

Spitzbergen. *Norske G. Selsk. Aarb.* **6**, 1894–1895 (1895): 1–50. **Alme and Heyerdahl.**
Om Spitsbergen og den Wellmanske polarexpedition af cand. real. H. H. Alme. *With Map and Portraits, etc.*
"Kane's" Reise langs Spitsbergens vestkyst af Trygve Heyerdahl.

MATHEMATICAL GEOGRAPHY.

Decimal Division of Angles. **Rey-Pailhade.**

Le temps décimal. Par M. J. de Rey-Pailhade. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 223–230.

Geodesy—Levelling. *B.S.G. Lisboa* **14** (1895): 195-281. **Avila.**
Dos nivelamentos de precisão e da sua superficie de referencia. Pelo Conde d'Avila. *With Plates.*

On exact levellings, and the surface to which they are referred, including a description of various forms of recording tide-gauges, with a discussion of their curves.

Map Projections. *G.Z.* **1** (1895): 497–516. **Bludau.**
Ueber die Wahl der Projektionen für die Länderkarten der Hand- und Schulatlanten. Von Dr. Alois Bludau in Pr. Friedland. *With Plate.*
A discussion of the map projections best adapted for use in school atlases.

Maps—Projection. *B.S.G. Paris* **16** (1895): 177–182. **Germain.**
Projet d'une carte de la terre au 1 : 1,000,000^e^, choix du système de projection. Par A. Germain.

Relief Globe. **Reclus.**
Elisée Reclus. Projet de construction d'un Globe Terrestre à l'échelle du Cent-millième. Edition de la Société nouvelle, 1895. Size 10 × 6½, pp. 16. *Presented by the Author.*

Treats of the construction of a relief globe of the Earth on the scale of 1 : 100,000, a subject on which the author spoke at the London Geographical Congress.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Deserts. *Ann. G.* **5** (1895): 1–14. **Lapparent.**
Dépressions et déserts. Par M. A. de Lapparent.
This paper is noticed in the *Journal* for December, 1895, vol. vi. p. 574.

Experimental Geography. *C.R.* **121** (1895): 657–659. **Meunier.**
Essai d'application de la méthode expérimentale à l'histoire orogenique de l'Europe. Note de M. Stanislas Meunier.

The author speaks of a method for experimentally imitating the dislocations of the crust on a contracting globe.

Forests and Mountains. **Guénot.**
Des effets du déboisement des montagnes. Par M. Guénot. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 231–255.

Geological Climate. *Petermanns M.* **41** (1895): 252–256. **Woeikow.**
Geologische Klimate. Von Prof. Dr. A. Woeikow in St. Petersburg.

Limnology. *Globus* **68** (1895): 357–361. **Greim.**

Die Fortschritte der Limnologie. Von Dr. G. Greim.

A critical resumé of recent researches on lakes.

Meteorology. *Z. Ges. Erdk. Berlin* **30** (1895): 368–374. **Baschin.**

Zur Frage des jahreszeitlichen Luftaustausches zwischen beiden Hemisphären. Von Otto Baschin.

Also separate copy. *Presented by the Author.*

Meteorology. *Rev. Maritime et Colon.* **127** (1895): 168–178, 272–322. **Duponchel.**

La circulation des vents et de la pluie. Notes complémentaires et explicatives. Par M. A. Duponchel.

Meteorology—Cyclones. **Kitao.**

J. College Sci. Imp. University, Japan **7** (1895): 293–402.

Beiträge zur Theorie der Bewegung der Erdatmosphäre und der Wirbelstürme (dritte Abhandlung). Von Dr. Phil Diro Kitao.

Meteorology—Forecasting. *Ann. Hydrographie* **23** (1895): 379–387. **Bebber.**

Der Wetterdienst an der Deutschen Seewarte. Von Prof. Dr. W. J. van Bebber.

An account of the weather-forecasting arrangements at the German Naval Observatory in Hamburg.

Oceanography—Waves. *C.R.* **121** (1895): 15–19. **Boussinesq.**

Lois de l'extinction d'une houle simple en haute mer. Par M. J. Boussinesq.

Physical Geography. **Tarr.**

Elementary Physical Geography. By Ralph S. Tarr. New York: Macmillan & Co., 1895. Size 8 × 6, pp. xxxii. and 488. *Illustrations. Price* $1.40. *Presented by the Publishers.*

Professor Tarr was fortunate in writing this little book, by having a larger work on the same subject nearly ready for publication, and he has certainly been able in many ways to advance upon the similar works which have preceded his. This is a true physical geography, giving special prominence to land-shaping agencies and their result. The numerous illustrations are very well chosen, but sometimes they are reproduced on a scale so small as to lose their effect.

Plant modification. *Ann. G.* **4** (1895): 393–419. **Bonnier.**

Les plantes de la région alpine et leurs rapports avec le climat. Par M. Gaston Bonnier. *With Maps and Illustrations.*

Illustrations are shown of the forms exhibited by the same plant grown in the plain and on the mountain slopes.

ANTHROPO-GEOGRAPHY AND HISTORY.

Anthropo-geography. *G.Z.* **1** (1895): 361–375. **Hettner.**

Die Lage der menschlichen Ansiedelungen. Ein Vortrag. Von Alfred Hettner.

This will be referred to in the Monthly Record.

Anthropology. **Fewkes.**

A Comparison of Sia and Tusayan Snake Ceremonials. By J. Walter Fewkes. Reprinted from the *American Anthropologist*, Vol. viii. No. 2. Washington, April, 1895. Washington: Judd & Detweiler, 1895. Size 10 × 6¼, pp. [24.] *Presented by Francis Parry, Esq.*

Anthropology. **Lemire.**

Du rôle de la femme dans la colonisation. Par M. Ch. Lemire. Congrès National des Sociétés Françaises de Géographie. XV^e^ Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon, E. Vitte, 1895. Size 10 × 6¼, pp. 389–393.

Anthropology. **Ratzel.**

The History of Mankind. By F. Ratzel. Parts I.–III. London: Macmillan & Co. [1895]. Size 10 × 7, pp. 48. *Maps and Illustrations. Price* 1*s.* *Presented by the Publishers.*

We welcome the commencement of the English version of a very important work, which deservedly holds a high reputation in the scientific world. The style of printing and illustration leaves nothing to desire.

Commercial Geography. **Annenkoff.**

Conférence sur l'importance de la Géographie en vue de la crise économique et agricole actuelle. 1895. Size 11 × 9, pp. 16. [Par le Général Annenkoff.] *Presented by the Author.*

Proof of a paper read at the Sixth International Geographical Congress.

Historical—Leif Ericson. ——

Flateyjarbok. Published by the Royal Danish General Staff, Topographical Department. Copenhagen, May, 1893. Size 19½ × 17, pp. [28]. *Presented by Clements R. Markham, Esq.*

This is a facsimile of the old Icelandic MSS. of the Saga of Leif Ericson with translations in English and Danish in parallel columns. It is the text of the earliest record of the discovery of America.

Historical Maps. ——

Søkaart-Archivets Antike Kaartsamling, 1895. Copenhagen: F. Dreyer, 1895. Size 9½ × 6, pp. 78.

A catalogue of the marine charts in the Royal Archives in Copenhagen.

Historical—Map Projections. *Mem. S.G. Italiana* **5** (1895): 165–201. **Fiorini.**

Sopra tre speciali projezioni meridiane e i mappamondi ovali del secolo XVI. Memoria del socio M. Fiorini.

Language. **Wallace.**

The Expressiveness of Speech; or, Mouth-gesture as a factor in the origin of language. By Alfred R. Wallace. Reprinted from the *Fortnightly Review* for October, 1895. London: Chapman & Hall. Size 10 × 6½, pp. 16. *Presented by the Author.*

BIOGRAPHY.

Biography. ——

Biographies of Ferreira de Amaral, Luciano Cordeiro, and Ernesto de Vasconcellos [in French]. From "*Portugal em Africa.* Revista Scientifica, Publicação mensal." No. 19—July, 1895. Lisbon. Size 10½ × 7, pp. [144]. *Map and Portraits.*

This number of *Portugal em Africa* contains, in addition to the portraits and biographies, a series of papers by various authors on Portuguese colonization and the history of discovery.

Biography. **Plarr.**

Men and Women of the Time. A Dictionary of Contemporaries. Fourteenth Edition. Revised and brought down to the present time. By Victor G. Plarr. London: G. Routledge & Sons, 1895. Size 9 × 6, pp. viii. and 986.

Heber. **Smith.**

Bishop Heber, Poet and chief Missionary to the East, second Lord Bishop of Calcutta 1783–1826. By George Smith. London: John Murray, 1895. Size 8½ × 5½, pp. xx. and 370. *Map, Portrait, and Illustrations.* Price 10*s.* 6*d.* *Presented by the Author.*

This may be viewed as a companion volume to the author's Life of Henry Martyn, recently noticed in the *Journal*.

Rawlinson. **Cordier.**

Notice sur Sir Henry C. Rawlinson, Bart. Par M. Henri Cordier. (Extrait du Compte rendu des Séances de la Société de Géographie, No. 6, 1895.) Paris. Size 9 × 5½, pp. 4. *Presented by the Author.*

Rawlinson. *Le Globe B.* **34** (1895): 135–144. **Chaix.**

Le Général Sir Henry Rawlinson. Par M. le prof. Paul Chaix.

Strozzi. *Mem. S.G. Italiana* **5** (1895): 110–148. **Uzielli.**

Piero di Andrea Strozzi viaggiatore fiorentino. Del prof. Gustavo Uzielli.

Thomson. *Scottish G. Mag.* **11** (1895): 524–528. **Bartholomew.**

Joseph Thomson. By J. G. Bartholomew.

GENERAL.

Ballooning. *Blackwood's Mag.* (1895): 669–678. **Powell.**

A Trip Heavenward: Ballooning as a Sport. By B. Baden Powell.

An animated description of the methods and incidents of ballooning.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications since November 7, 1895.

1-inch—General Maps:—

ENGLAND AND WALES:—241, 343, hills engraved in black or brown; 259, 329 (revision), engraved in outline, 1*s.* each.
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25-inch—County Maps:—

ENGLAND AND WALES:—**Berkshire** (revised), XLIA. 4, 7, 8; XLIIA. 1, 2; XLII. 10, 11, 13, 14; XLIII. 9, 10, 11, 12. **Cornwall** (revised), XLVI. 14. **Hampshire** (revised), II. 10, 11, 13, 14, 15, 16; III. 9, 10, 11, 12, 13, 14, 15, 16; VII. 4, 7, 8, 11, 12, 15, 16; VIII. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16; XV. 8. **Middlesex** (revised), XIX. 8, 15; XX. 1, 5, 13; XXIV. 3, 8, 12; XXV. 1, 5. **Surrey** (revised), XIII. 3, 4, 7, 8, 9, 10, 13, 14. **Wiltshire** (revised), XLIII. 4, 7, 8, 11, 15, 3*s.* each.

Town Plans—5-feet scale:—

London—Re-survey, I. 68; III. 22, 33, 34, 35, 44, 45, 55, 61, 72, 82, 83, 92; VI. 50; VII. 3, 7, 18, 19, 20, 39, 40, 80, 81, 82, 89, 90, 92, 93, 96, 97, 98, 99, 100; VIII. 53; X. 19, 41, 43, 60; XI. 1, 3, 12, 19, 22, 33, 34, 36, 37, 38, 39, 41, 44, 45, 47, 48, 50, 53, 54, 57, 58, 59, 62, 63, 64, 67, 69, 73, 75, 78, 81, 86, 87, 88, 89, 90, 94, 98, 100; XII. 11, 12, 21, 31, 41, 43, 44, 51, 52, 53, 62, 63, 71, 72, 73, 81, 83; XV. 2, 34, 35, 45; XVI. 75, 2*s.* 6*d.* each. Index, 3*d.*

(*E. Stanford, Agent.*)

Scotland. **Bartholomew.**

The Royal Scottish Geographical Society's Atlas of Scotland. A series of sixty-two plates of maps and plans illustrating the topography, physiography, geology, natural history, and climate of the country. By J. G. Bartholomew, F.R.S.E., F.R.G.S. Drawn, engraved, and printed at the Edinburgh Geographical Institute, 1895. *Presented by the Author.*

During the time that this excellent atlas has been in course of preparation, notices have appeared in the *Geographical Journal*, calling attention to the careful and thorough manner in which the maps had been prepared, and the very clear style in which they had been produced. It is several years since Mr. J. G. Bartholomew commenced the work which he has now brought to so successful a conclusion. The labour involved in the compilation of such an atlas as this has of necessity been very great, including as it does the information contained in the Ordnance, Admiralty, and Geological Surveys of Scotland, as well as the data obtainable from the Scottish scientific societies.

The basis of the atlas is the Ordnance Survey, and it consists of forty-five sectional maps, on the uniform scale of half an inch to the mile, in addition to which a series of physical maps are given. Where the Ordnance Survey has been known to be out of date, the maps of that district have been revised by persons possessing a special knowledge of the locality.

The first ten maps are devoted to the physiography, meteorology, geology, natural history, languages, and political divisions of Scotland. These are executed with special skill, knowledge, and care. The maps showing distribution of population and languages are in reality original, are highly suggestive, and are models of tinting. Besides a geographical map, there are several maps showing the distribution of various classes of animals. The meteorological maps are of the most detailed character. These are followed by the sectional maps on the half-inch scale, printed, where necessary, in contours, with fourteen shades of colour, showing the elevations of the land and depths of the sea. The new county and parish boundaries, as determined by the recent Boundary Commission, are shown; while the accuracy with which the new roads, railway and steamer routes have been laid down, as well as the thoroughly revised town plans, render this atlas invaluable as a work of reference to tourists and others.

The accompanying letterpress, which will be found on the opening pages of the atlas, has been contributed by the following gentlemen: the late John Bartholomew on geography; Sir Archibald Geikie, geology; Prof. J. Geikie, physiography; and

Dr. Alexander Buchan, on meteorology. These are such well-known authorities on the subjects of which they treat, that their names are sufficient guarantee of the value of their contributions. Professor James Geikie's contribution is an excellent study in physical geography, while the other information given is all appropriate and well arranged. The chronology of the cartography of Scotland is of special interest to the geographer.

The manner in which the maps have been produced reflects credit on all who have had a hand in their preparation; and, taken as a whole, this atlas marks a new departure in the cartography of Scotland. The delicacy and precision of the shades of tinting and the beauty of the colours used will stand comparison with the best work of the kind in any country. The work shows that, with the material at the command of the map publisher, and under the direction of such a capable geographer as Mr. J. G. Bartholomew, it is possible to produce an atlas equal, both as regards its accuracy and style of production, to any that has been published in Europe or America. It should be noted that Mr. Bartholomew does not take to himself the credit of the work done by others. He mentions by name every one inside and outside his establishment who has been engaged in the production of this atlas.

AFRICA.

Somaliland. **Christie, Sparrow, and Mainwaring.**

Sketch of the Routes in Somaliland, travelled by R. B. B. Christie, Esq.; Lieut. R. Sparrow, 7th Dragoon Guards; and Major H. G. Mainwaring, 1st Batt. South Wales Borderers, in 1894. Scale 1:1,267,200 or 20 stat. miles to an inch. *Presented by the Authors.*

West Africa. **Johnston.**

W. & A. K. Johnston's map to illustrate the Ashanti Expedition in West Africa. Scale 1:710,000 or 11·2 stat. miles to an inch. Messrs. W. & A. K. Johnston, London and Edinburgh. *Price* 1*s. coloured. Presented by the Publishers.*

Witwatersrand. **Goldman.**

Map of the Witwatersrand. Scale 4100 feet to an inch. By S. Goldman. Corrected to May, 1895. 2 sheets. *Price* £1 10*s. G. Philip & Son, London.*

This map has been corrected to May, 1895. It shows the position and extent of all the mining claims of the Witwatersrand, and several insets of special districts are given on enlarged scales. In the notes on the body of the map, there is a general description of Witwatersrand, its geological formation, and gold-mining. The map appears to have been carefully prepared, and will no doubt be useful to persons interested in the gold-mining industry of South Africa.

Zululand. **Garrard.**

Map of Zululand, showing the Relative Positions of the various Gold and Coal Fields, and the Routes of Approach. Compiled to accompany the Report on the Mineral Resources of Zululand, dated January, 1895, by J. Jervis Garrard, ASSOC.M.INST.C.E., Deputy-Commissioner of Mines for Zululand. Scale 1: 316,800 or 5 stat. miles to an inch. *Price* 10*s.* 6*d. G. Philip & Son.*

The localities where coal and gold are to be found in Zululand are indicated on this map, as well as the positions of native kraals, and the routes by which the gold and coal fields can be approached.

AMERICA.

Ecuador, etc. **Dowding.**

Map showing Explorations and Surveys of Captain H. W. Dowding, R.N., from Quito, down the course of the Rio Napo to its junction with the Rio Marañon, 1893. Scale 1: 2,100,000 or 33 stat. miles to an inch. E. Stanford, London. *Presented by Captain H. W. Dowding, R.N.*

Peru. **Raimondi.**

Mapa del Peru. A. Raimondi. Scale 1: 500,000 or 7·9 stat. miles to an inch. Engraved and printed by Erhard Bros., Paris. Sheets:—17, 18, 19, 20, 22, and 24. *Presented by the Geographical Society of Lima.*

The six sheets which form the present issue of this map include a portion of

Central Peru, and the coast from Pativilca to Pisco. Twenty-three sheets of this map have now been published, leaving eleven to complete it. It is printed in colours; the rivers and lakes in blue, the forests green, and the hill work in brown. It is nicely drawn, the hill shading is very effective, and at the bottom of each sheet a full explanation is given of the conventional signs used.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during September and October, 1895. *Presented by the Hydrographic Department, Admiralty.*

No. Inches.

394 m = 4·9 England, south coast:—Spithead. **2s. 6d.**

693 m = 6·7 Harbours on the east coast of England:—Whitby harbour. **1s. 6d.**

2353 m = 1·0 France, west coast:—Rade de Croisic to Presqu'ile de Quiberon. **2s. 6d.**

2610 m = 4·9 France, north coast:—Fécamp. Treport. **1s. 6d.**

1195 m = 4·47 Spain, east coast:—Approach to port of Barcelona (plan, port of Barcelona). **2s. 6d.**

430 m = 1·0 Corsica, west coast:—Lava bay to Cape Morsetta. **2s. 6d.**

564 m = 14·4 Sardinia, north coast:—Maddalena and approaches. **2s. 6d.**

369 m = various. Plans in the Cape Verde islands:—St. Vincent, St. Lucia, Branca and Raza, St. Nicholas, Mayo, Rolla road, Tarrafal bay (St. Antonio island), Sal, Porto Praya, English road (Bonavista island), Mordeira bay, Fajao D'agua, Tarrafal bay (St. Jago island), English road (Mayo island). **2s. 6d.**

2876 m = 0·5 Newfoundland, west coast:—Codroy road to Bear head. **2s. 6d.**

2670 d = 3·4 America, east coast:—Halifax to the Delaware. **2s. 6d.**

411 m = various. Anchorages on the north coast of Cuba:—Bahia Honda, Nuevas Grandes, Port Manil, Puerto de las Nuevitas del Principe, Port Matanzas, Channel of Puerto de las Nuevitas del Principe (*reproduction*). **1s. 6d.**

418 m = various. Anchorages on the north coast of Cuba:—Port of Monati, port of Cibara, Port Jururu, Port Padre, Port Barial (*reproduction*). **1s. 6d.**

423 m = various. Anchorages on the north coast of Cuba:—Puerto de Vita, Port Sama, Port Naranjo, Port Banes, Port Nipe (*reproduction*). **1s. 6d.**

428 m = various. Anchorages on the north coast of Cuba:—Ports of Cabonico and Levisa, Port Cananova, Port Tanamo, Port Cebollas, Port Yaguaneque (*reproduction*). **1s. 6d.**

373 m = various. Plans in the Gulf of Mexico:—Coatzacoalcos river, mouth of the Coatzacoalcos river, Alacran reef, Alacran port, Cay Arenas and adjacent reefs, Eastern and Southern Triangles, Arcas cays, Sisal reefs, Sisal reef, Madagascar reef, Anchorage off Sisal (*reproduction*). **2s. 6d.**

2348 m = 4·35 North America, west coast:—Sitka harbour and approaches. **1s. 6d.**

1215 m = 1·5 Anchorage on the west coast of Africa:—Benguela bay. **1s. 6d.**

685 { m = 0·37 / m = 6·28 } Africa, east coast:—Bazaruto bay (Pungo bay), Limpopo river entrance. **1s. 6d.**

704 m = 0·5 Madagascar, north-west coast:—Nosi Shaba to Moramba bay, including Narendri bay. **2s. 6d.**

377 m = 0·5 Madagascar, west coast:—Moramba bay to Maromanjo point, including Mahajamba bay. **2s. 6d.**

794 m = 0·25 Strait of Malacca:—Pulo Berhada to Cape Rachado **2s. 6d.**

415 m = 1·64 Philippine islands:—Pujaga bay. **1s. 6d.**

416 m = 2·68 Paláwan island:—Malanut y Nakoda. **1s. 6d.**

1338 m = 3·0 China sea:—Pescadores islands, inner channels. 2*s.* 6*d.*
770 { m = 5·85 / m = 1·95 } Anchorages in Japan, inland sea:—Tomo Asea, Himeshima roads. 1*s.* 6*d.*
2211 m = 9·58 Samoa, or Navigator islands:—Apia harbour. 1*s.* 6*d.*
1382 m = 0·5 Society islands:—Tahiti and Murea (plan, Papetoai and Paopao bays) (*reproduction*). 2*s.* 6*d.*
1300 Plans on the coast of Chile:—Plan added, Huentelanquen cove.
1278 Cape Paquica to Cape Lobos:—New plan, Huaina, Pisagua bay.
2195 Sketch-plans of anchorages in the eastern part of Celebes:—Plans added, Gorontalo river, Tilamuta harbour.
2196 Sketch-plans of anchorages in the southern part of Celebes:—Plan added, Kali Susu bay.
1508 Anchorages in New Hebrides islands:—New plan, Steep Cliff bay.
(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1195	Port of Barcelona	New Chart. Approach to port of Barcelona (plan of port of Barcelona)	1195
368	Tarrafal bay	New Chart. Plans in Cape Verde islands	369
369	St. Vincent		
377	St. Lucia, Branca and Raza		
378	St. Nicholas		
379	Sal		
381	English road, Mordeira bay		
382	Mayo		
384	Porto Praya		
2670	Halifax to the Delaware	New Chart. Halifax to the Delaware	2670
415	Port Matanzas anchorages	New Chart. Anchorages on the north coast of Cuba	411
416	Nuevitas del Principe		
411	Bahia Honda		
413	Port Mariel		
417	Nuevas Grandes		
418	Port Manati	New Chart. Anchorages on the north coast of Cuba	418
419	Port Padre		
420	Port Cibara		
421	Port Jururu		
422	Port Bariai		
423	Puerto de Vita	New Chart. Anchorages on the north coast of Cuba	423
424	Port Naranjo		
425	Port Sama		
426	Port Banes		
427	Port Nipe		
428	Ports of Cabonico and Levisa	New Chart. Anchorages on the north coast of Cuba	428
429	Port Tanamo		
430	Port Cebollas		
431	Port Cananova		
432	Port Yaguaneque		
373	Coatzacoalcos river	New Chart. Plans in the Gulf of Mexico	373
1203	Alacran shoal and port		
1206	Sisal reefs and anchorages		
1209	Cay Arenas and adjacent reefs		
1829	Arcas cays		
1830	Obispo shoals, Eastern and Western Triangles		

2348 Sitka harbour and approaches	New Chart. Sitka harbour and approaches . . . 2348
627 Plan of Benguela bay on this sheet	New Chart. Anchorages on the west coast of Africa 1215
704 Narendri bay and Antambo river	New Chart. Nosi Shaba to Moramba bay, including Narendri bay 704
794A North and south sands	New Chart. Pulo Berhada to Cape Rachado . . 794
794B	
770 Tomo and Hime Sima roads	New Chart. Anchorages in Japan, Inland sea . . 770
1730 Plan of Apia harbour on this sheet	New Chart. Apia harbour 2211
1382 Tahiti and Murea	New Chart. Tahiti and Murea 1382
931 Anchorages in Celebes	

Charts that have received Important Corrections.

No. 2598, Curves of equal Magnetic Variation. 1118A, Scotland, north coast:—Shetland isles, Sheet 1. 1118B, Scotland, north coast:—Shetland isles, Sheet 2. 122, North sea, Netherlands:—Mouths of the Maas. 2362, Sweden, Sheet 4:—Landsort to the Gulf of Bothnia. 2297, Gulf of Bothnia:—Hango head to South Quarken, including Aland islands. 2431, North America, west coast:—Port Simpson to Cross sound. 1499, North America, west coast:—Cross sound to Kadiak. 1421, Africa, east coast:—River Chind, bar and entrance. 1390, Africa, east coast:—Chale point to Pangani, including the island of Pemba. 40, India, west coast:—Karachi harbour. 2460, Pacific Ocean:—Kamchatka to Kadiak island. 2383, Solomon islands:—Marovo lagoon. 1570, Pacific ocean, New Hebrides:—Malo island to Efate island. 2225, New Hebrides:—Ambrym island. 1339, Pacific ocean, Samoa islands:—North coast of Upolo, between Falifa harbour and Falulu point.
(*J. D. Potter, agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for September, October, November, and December, and North Atlantic Ocean for August, September, and October, 1895. Published monthly at the Hydrographic Office, Bureau of Navigation, Department of the Navy, Washington, D.C. Charles D. Sigsbee, Commander U.S. Navy, Hydrographer. *Presented by the U.S. Hydrographic Office.*

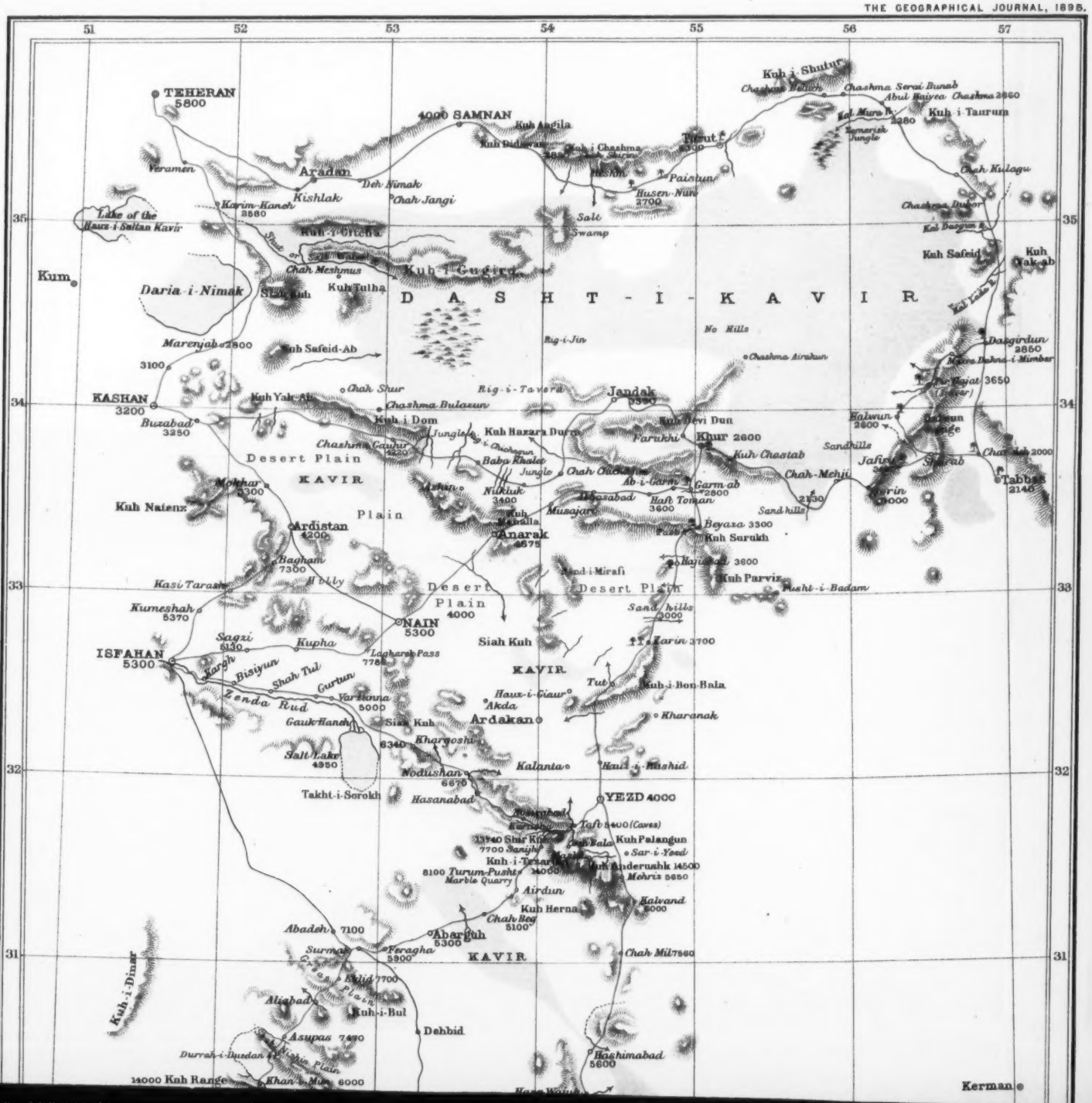
PHOTOGRAPHS.

South Africa. **Holub.**

Dr. Emil Holub's Südafrikanische Ausstellung, Prag. 1892, B. Anthropologie und Ethnologie. An Album containing 38 Photographs. *Presented by Dr. Emil Holub.*

This is a series of 38 photographs of models prepared under the superintendence of Dr. Emil Holub from his sketches. The figures and dwellings from which the photographs are taken are natural size, and the time occupied in their preparation was four and a half years. They are intended to represent scenes during Dr. Holub's travels in South Africa, in addition to which there are photographs of numerous natural history specimens.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.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TEHERAN 5800
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Kuh i Taurum
Aradan
Veramen
Kishlak
Deh Nimak
Chah Jangi
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Kuh Sidkuran
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Paisiun
Husen-Nun 2700
Chah Kulagu
Lake of the Haux-i-Sultan Kavir
Karun-Kaneh 2580
Kuh i Gichu
Salt Swamp
Kum
Daria i-Nimak
Chah Meshmus
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Kuh Tulha
D A S H T - I - K A V I R
Kuh Safeid
Kuh Yakab
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Marenjab 2800
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Kuh Safeid-Ab
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No Hills
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KASHAN 3200
Kuh Yak-Ab
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Rig-i-Tavera
Jandak 3300
Buzabad 3250
Kuh i Dom
Jungle
Kuh Hazara Durra
Kuh Devi Dun
Parukhi
Khur 2600
Halwun 3200
Chashma Canhur 4220
Desert Plain
KAVIR
Baba Khalee
Chah Chakan
Kuh Chestab
Sandhills
Jafir
Chah-Mehji
Tabbas 2140
Mohhar 3300
Kuh Natenz
Nukluk 3400
Ab-i-Garm
Garmab 2800
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Plain
Musajarn
Ardistan 4200
Anarak 4675
Beyaza 3300
Kuh Surukh
Bagham 7300
Hajiabad 3600
Kuh Parviz
Kasi Tarash
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Desert Plain
Desert Plain
Kumeshah 5370
Sand hills 2000
NAIN 5300
Siah Kuh
Zarin 3700
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Kupha
Lagharak Pass 7780
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Shah Tud
Gurtun
Zenda Rud
Yar-kanna 5000
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Salt Lake 4950
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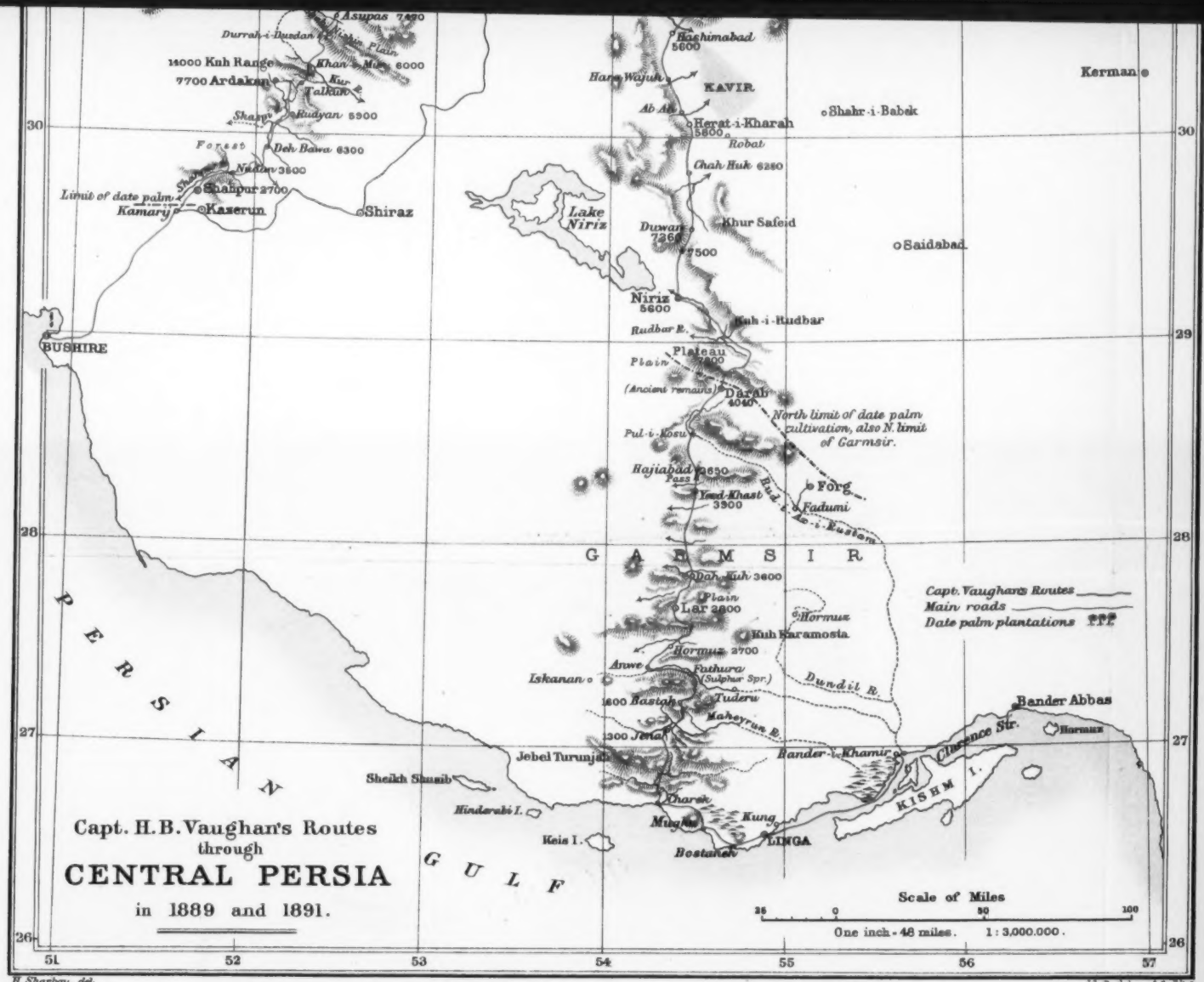

Capt. H. B. Vaughan's Routes through CENTRAL PERSIA in 1889 and 1891.

H. Sharbau, del.

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